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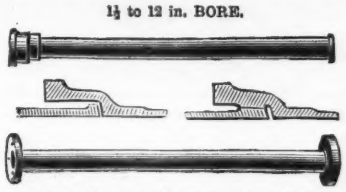

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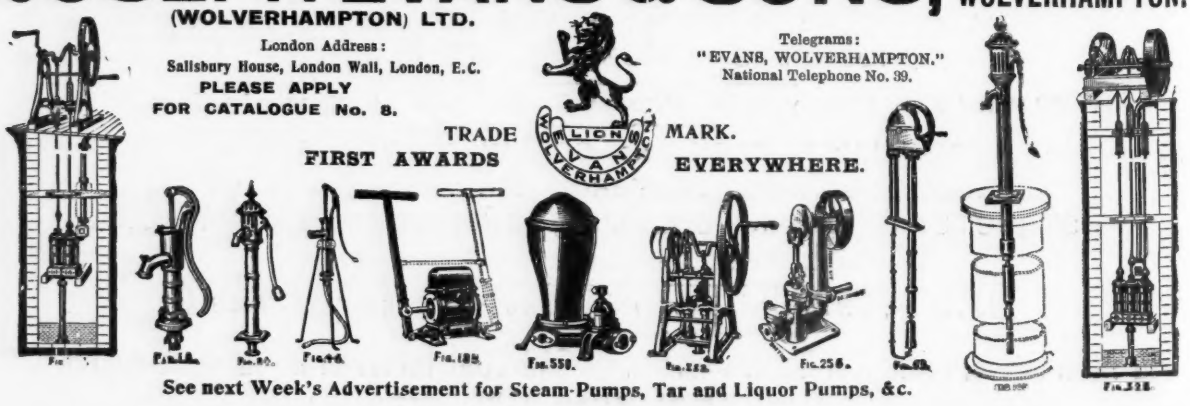

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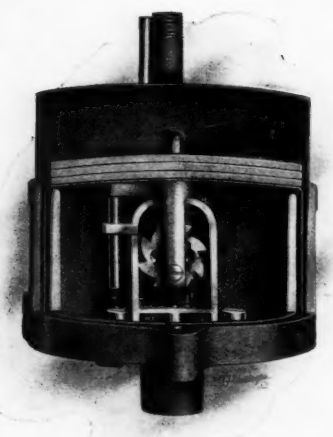

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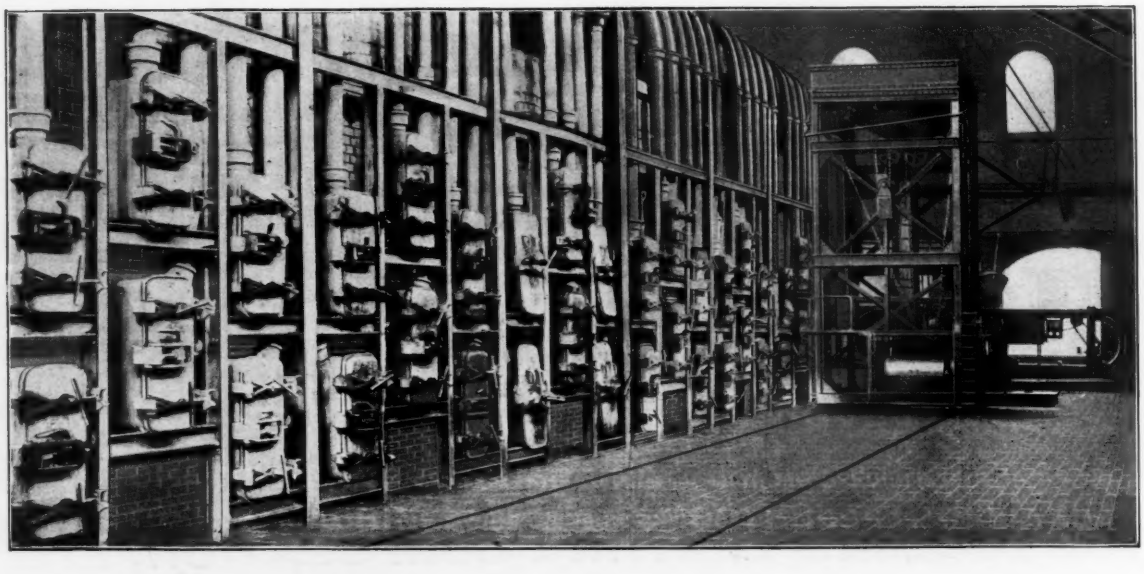

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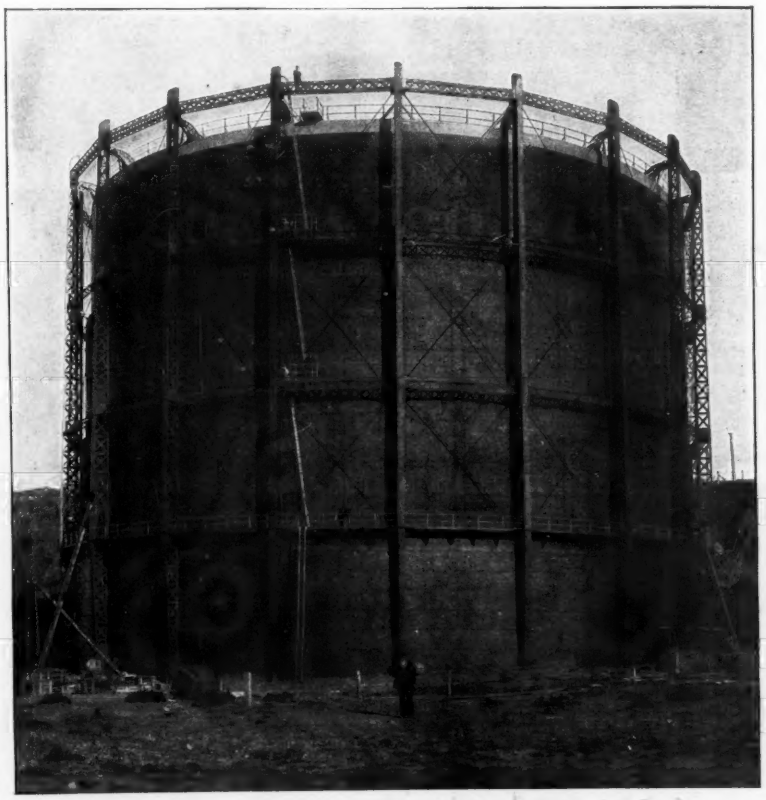

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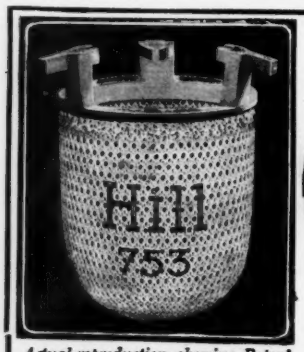

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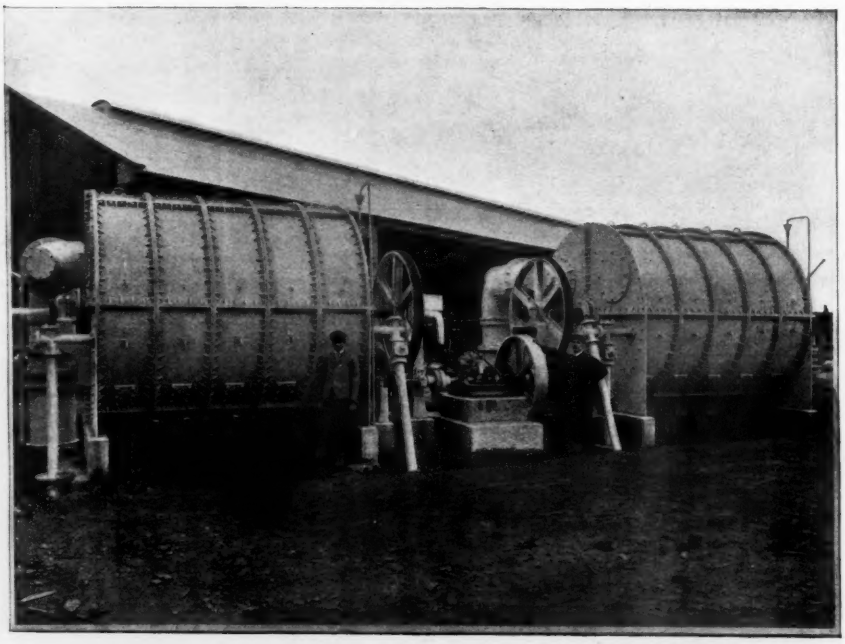

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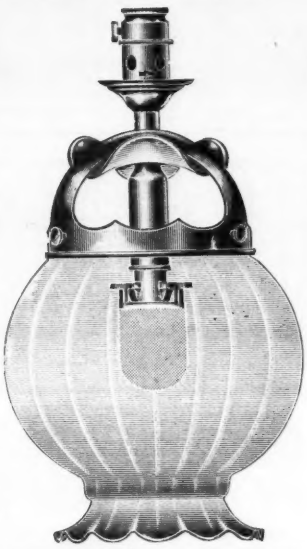

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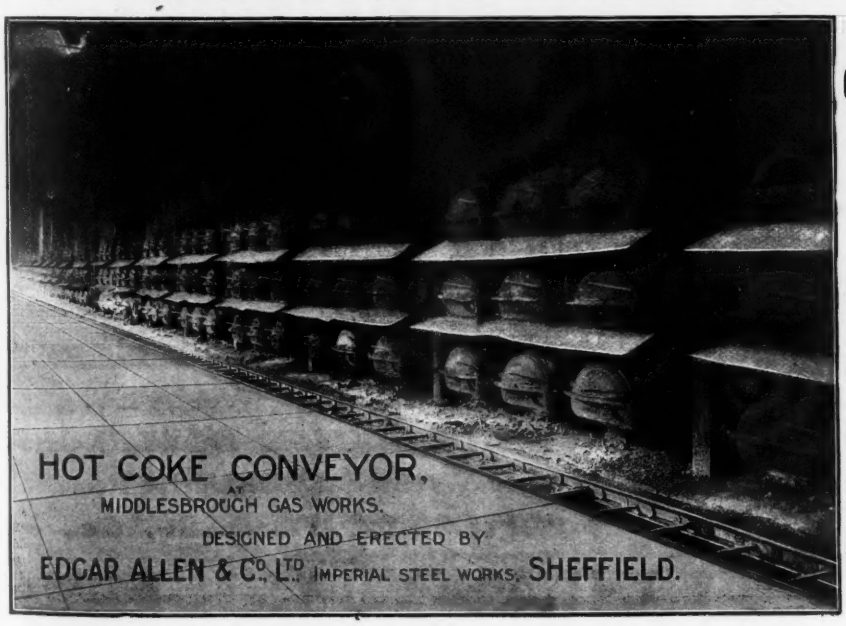

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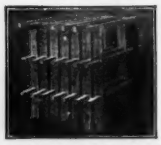

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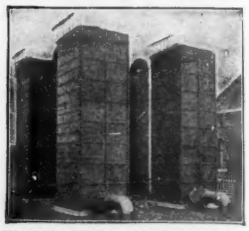

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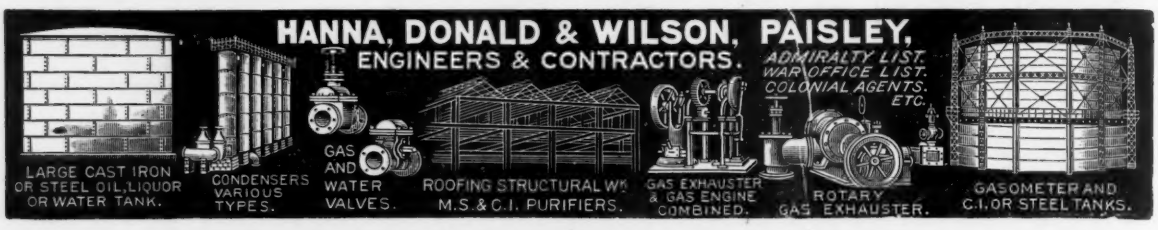
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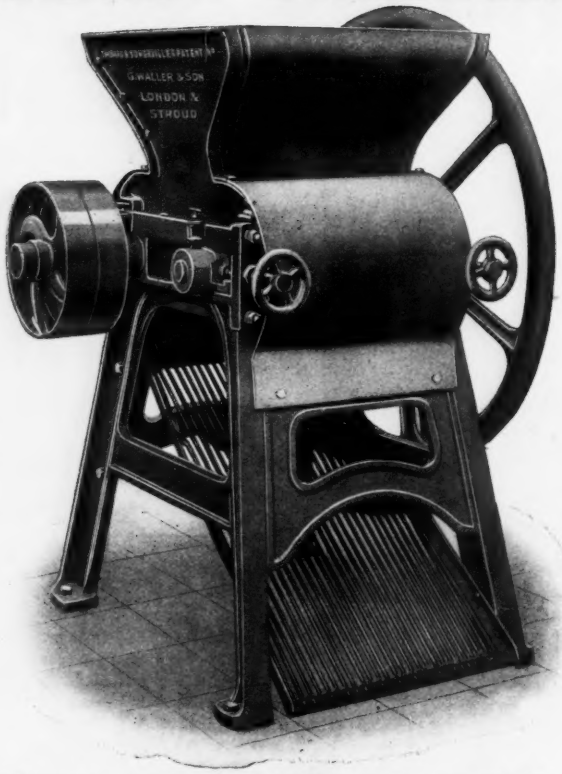

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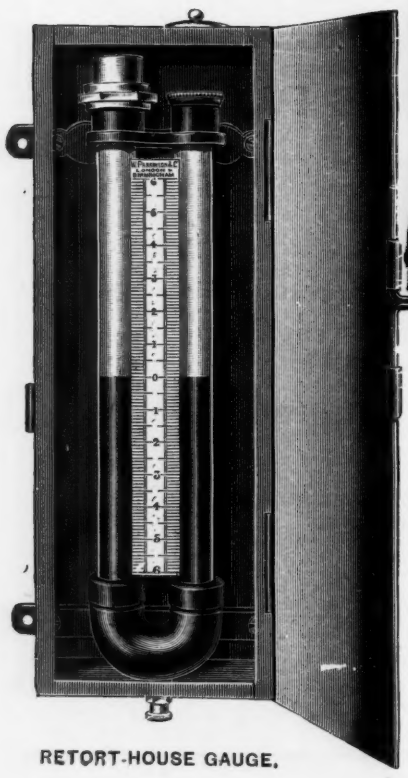

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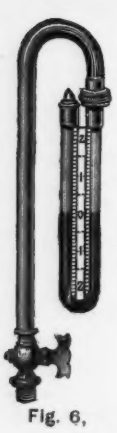

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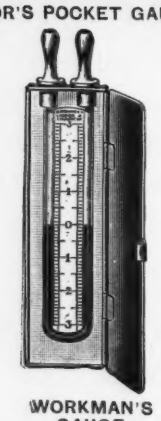

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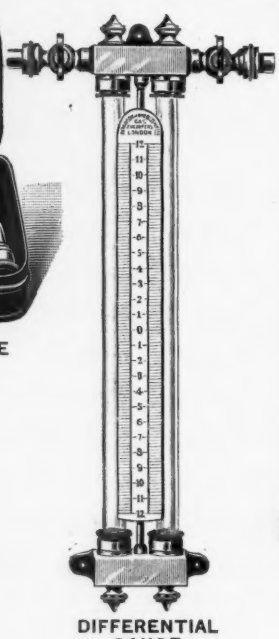

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Fig. 5B.

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EDITORIAL NOTES—GAS, &c.

Ideals of the Past & Achievements of the Present.

IF Mr. Vincent Hughes, in setting to work upon the preparation of the address with which he inaugurated his year of office as President of the Midland Association of Gas Managers, had in view the making of our present-day inventive geniuses in the gas industry feel that in initiative they were forestalled by workers of a long-dead past, he has assuredly succeeded; for, in connection with many of the lines of activity of our times, he showed that there were workers, in the early and middle days of the industry, who evolved ideas that—crude they may have been, and possibly unworkable—were at any rate at the root of much of the current successful achievement. To dip into the past for material for his address was an excellent thought for the Engineer and Manager of the Smethwick Gas-Works; seeing that the gas-works lands adjoin the very scene of the triumph of Murdoch in providing the first means of giving to city, town, and village an organized supply of light and heat and power. From the top of the purifiers on the Smethwick Gas-Works can be seen the house where Murdoch lived and died. Mr. Hughes lives in an atmosphere of inceptive associations with the gas industry; though he himself, in his practices, is very much up-to-date. Possibly, however, the former fact accounts for his love of research into the archives of invention to ascertain the animating thoughts and aims of the industry's technical pioneers. It is not a bad exercise. It teaches us something as to how much we owe to those pioneers; and how very little credit, thoughtlessly perhaps, we have granted to them. It is, of course, natural that those things that are adjacent to us in our daily comings and goings—the great achievements of to-day—should be more impressive than the things in the line of invention of a bygone age. Compared in any way, especially in relation to effect, some of the invention of the past seems, not unnaturally, puny alongside more recent accomplishments.

Among the several things, however, of which the President's research into invention in connection with the gas industry informs us, is the fact as to how near many of the ideals and inventions in the early days of the industry (then discarded as unsuitable) were to the successes of to-day. They were embryonic; but the rudiments of many a construction or appliance that are of immense utility, productively and economically, are found in those ideals and inventions. The inventors were premature; their inventions immature. They saw what was wanted to accomplish certain things; but their knowledge was insufficient to produce the necessary measure of perfection. Knowledge has expanded—it is ever expanding—with experience; and from that ever-accumulating knowledge are developed those fresh ideas that assist to make the crudities of the past the perfections of the present. Viewed from many an inceptive standpoint in the distant past, things that, in later day, became possible and then actual, appeared to be impossible; and nothing but accrued knowledge completely altered the status from failure to success. As we look at the aspirations and the objects of the early workers whose failures are the successes of to-day, there cannot but be admiration for their prescience and sentiency, and sympathy with them that the experience and knowledge of their times were checks to the fulfilment of their aims and ambitions. Mr. Hughes calls attention to some inventions for which patents were actually taken out. There is the vertical retort; and even the taper of the structure to facilitate the discharge was thought of in 1828. In 1857 it was recognized that an increased make could be obtained from the carbonization of coal in vertical retorts. Murdoch long before tried many varieties of retorts of divers shapes, set vertically, on an incline, and horizontally, as illustrated in "King's Treatise." But it is with patented work that the President deals. The idea of continuous carbonization was the subject of patents in the middle of the last century; so was also the inclined retort. Right back to 1824, an inventor had got the notion of admitting steam into carbonizing appliances. The coalite process was in the beginning of the century frequently carried out, though not so named. Even the process of opening and closing of gas cocks and the ignition of the gas by means of electricity was so far framed in mind and outlined on paper that a patent was taken out in 1856. By the aid of a thermostatic lever, regulation of air supply was decades ago introduced in the construction of burners and ventilators. And so we pass on through the address, having brought before us the shadows of many a success of this generation.

Life is short; and the times are strenuous. But if the right men with the right ability could penetrate the masses of undeveloped invention, they might find much that is now lying dormant that could, by the application of the knowledge of our times, have the defects extirpated, and just those concomitants necessary to efficiency and perfection incorporated. There is no doubt that vast utility lies buried in much of this initial work of distant times—just as there is much treasure lying at the bottom of the sea. The combination of the initiative of the past and the knowledge of to-day would indubitably produce in many ways a rich meed of success from unsuccess—the latter because of the absence time ago of the essential knowledge that could only be gained from experience. As a matter of fact, in most inventions of to-day, there is really little of the primary order. They are more or less clever combinations and adaptations of knowledge and prior achievement. Still if the combination itself is original, if the useful result of the combination is something that excels in any way that of prior method or process, it constitutes invention; and all honour and reward to the inventor. But the inventor of to-day owes much to a long line of predecessors in invention; and to them is largely due the credit of enabling him to produce a practical whole transcending in one or more points of effectiveness that which has been done before. If Mr. Hughes' recital of some of these earlier prototypes (incomplete though they were) of present successes has done nothing else than cause us to pause and admire the intellectual geniuses in the inchoative stages of the life and work of the gas industry, and to admit as correct much of the direction they gave by their work, he has done good service. Those men laboured amid the crude surroundings of the gas industry of their time; and when this is remembered and combined with the honour of their initial (if not always successful) schemes and processes, it will help us at any rate to think less of our own achievements made in the light of experience constantly being broadened and deepened by time and intellectual expansion.

Wanted, Grounds for Judgment as to Superiority.

THE field of modern carbonizing practice over which Mr. A. T. Harris roamed in the paper read before the Midland Association last Thursday is so vast that, when members come to discuss it at their autumn meeting, they ought to find sufficient material to provoke a discussion covering an entire sitting. The paper constitutes a masterly review of the carbonizing position within, having regard to the largeness of the subject, a narrow compass. But as the main feature of the paper is considered, what does the position really amount to? We cannot put away from ourselves the salient fact of the carbonizing situation to-day that, in respect of make per ton, the systems, including the old established ones, are tumbling over each other with results that have quantitative propinquity. And the question now is, On what ground or grounds must their superiority be judged? That is a matter which cannot be dealt with in any hasty or superficial manner, but is one that is discussable and requires deliberate treatment, and should not be lost sight of either before, or at the time, Mr. Harris's paper is on the *tapis* again. Because it is a fact that the narrow

differences in quantitative results are causing no little confusion among many gas engineers and managers whose experience is limited to the horizontal and inclined systems of working under modern conditions; and they now want to have focussed for them by engineers whose practical experience extends to other systems, those collateral and subsidiary questions (in the aggregate most important) upon which their judgment must be largely founded. On many of these points doubts and misunderstandings exist. We have Mr. Harris quoting Herr Körting's summary of the disadvantages, as he sees them, of the continuous vertical system, which summary can only be rebutted by the positive experience of the users of continuously operated retorts. Mr. Harris himself is not in a position to affirm or negative the suggestions of this high exponent of the virtues of the intermittent vertical system; but he, like others, desires to hear the other side of the story. One of the ascribed disadvantages is that the continuously worked retorts are not easy of inspection and repair; but Mr. Harris as good as suggests that the intermittent system has not much to boast about, inasmuch as he hears (again he has no other authority) that on settings being let down they are fissured to a somewhat serious degree. He also finds that the pressure is a drawback with the long drop of the full charge into the intermittently operated vertical retorts; but it may be pointed out that devices for grading the charges into large and small on opposite sides of the retort have cured the trouble in this regard, though it has introduced an additional operation. Then, on *à priori* considerations, Mr. Harris is disposed to question the adherence of the gas evolved from a charge of coal to any central pathway, though discussion has been carried to the extreme points between theorists and practical observers. The paper shows the amount of controversial matter that still awaits, if ever it can reach, final determination.

Mr. Harris's chief title to discuss the question of carbonization is the excellent work he has done with his old horizontal settings, though labouring under certain working disadvantages. It was as far back as 1907 that he proved the efficacy of the heavy charge in productive advantage; but drawing by hand and heavy charges were practices that did not recognize any relationship, and so the latter had to be abandoned. This resulted—Mr. Harris wanting the gains of the heavy charge and the full retort—in the adoption of a trial installation of Love's system of setting retorts at an angle of 45°. There were infantile troubles in respect of heating the setting and of pressure in the bottom tiers of retorts. In regard to heating, the defects were cured by the removal of the central retort and the enlargement of the combustion chamber. The trouble as to pressure varied with the character of the coal and the density of the charge in the retorts; and, in the latter respect, the difficulty was found to vary as between the top and bottom tiers, to the disadvantage of the latter—showing that the increased length of fall had something to do with the objectionable effect. Here again an improvement in the charging-shoot, in order to give greater control over the charge, resulted in a considerable modification of the difficulties. But such experiences are almost inseparable from a new system. They are discovered only to be, by the engineer, permanently corrected or reduced to negligible quantity. With no increase in fuel consumption, with a production of 12,300 cubic feet of 15·80-candle gas from a mixture of South Yorkshire and Derbyshire nuts, and with a coke of superior quality, the system takes its place fairly among the best of the rivals, but has to prove, like them, superiority in other directions to justify future favour.

For Common Protection.

The last issue of the "Illuminating Engineer" contains an editorial dealing, or purporting to deal, with Mr. Corbet Woodall's recent suggestion (*ante*, p. 368) that an exigent necessity of the times is a Government Departmental inquiry into the reckless competition and management of municipal electricity undertakings. But our young contemporary appears to avoid seeing the real object of Mr. Woodall's proposal, and applies it to an inquiry into the scientific treatment of street illumination. There is other work to be done before we reach that stage; and until that other work is accomplished, we cannot possibly expect the major part of the members of electrical trading local authorities to see the commonsense of considering the question of street illumination from the scientific side. They will not consider it from the plain standpoints of economy and efficiency; and something has to be done to first compel them to treat street lighting as a public service that has to be carried out efficiently and economically, and not as a service in which the municipally-owned electricity undertaking is to have preference, no matter the result. The electrically biassed optimates in local government will listen to no reason; they go headlong down the course they have marked out for themselves. It is to compel them to listen to reason, to show no favour, and to conduct local administration according to the original tenets of good government, that an inquiry by a competent authority is suggested. Purely scientific considerations can be left for subsequent treatment, after the more pressing matter has been disposed of, of bringing local authorities to an appreciation of the correct action in this matter, and assuring that preference is not guided by ownership, but by the fair commercial rule of obtaining the best value for money expended.

There is another matter to which the gas industry should give heed, and that is the question of co-operation for its commercial protection and advancement. The electricity industry has started its Publicity Committee supported by a common purse; and this propagandist body is proposing to extend its agency from London and the suburbs to the country generally. Already some thirty provincial electricity undertakings have attached themselvee as supporters of the Committee's operations. Columns of advertisement articles on metallic filament lamps and other subjects have appeared in the daily press; and much literature and illustrated mural advertisements is being prepared. The Committee are finding plenty of work in this direction. Their activity must be met by activity in a similar way. Publicity of this kind can only be attained by co-operation; and systematic tactics are required in carrying on the work. For instance, when a local authority owning an electricity undertaking are proposing to evict gas from street service, the Gas Publicity Committee—presuming the local gas undertaking to be a contributing body—could concentrate their efforts for the time being in enlightening the ratepayers of the town. The economy of the inverted incandescent gas burner has to be widely advertised; erroneous impressions (much has already been done) have to be removed in relation to gas-fires; and in numerous directions there is room for good co-operative work through a well-organized agency. The interests of the gas industry are being attacked; the gas industry must defend what it has already got, as well as work to make further progress. It is a fatuous course while working for more, to leave present possessions to take care of themselves. There are eyes smarting with envy looking over the wall of Naboth's vineyard. Is it not time to co-operate in its defence?

Advancing Economy and Existing Interests.

The gas industry cannot afford to ignore contemporary developments that in any way come into contact with its own immediate concerns; but at the same time it is impossible—and were it possible, it would be imprudent and the height of folly—to prevent the advance of anything that promotes the world's economy. The only thing to be done is to so endeavour to shape one's procedure, that whatever competition is set up the industry shall be in a better position to meet it. At the first blush, it may be said that the utilization of the gas from coke-ovens, blast-furnaces, and so forth cannot affect to any noteworthy degree the gas industry operating in those parts where such producers of gas suitable for power purposes exist. On second thoughts, however, it will be apparent that there are two ways in which, perhaps not largely, such utilization may affect gas undertakings more particularly in the manufacturing districts. The one is by using the gas for the generation of electricity, the supply of this in bulk to the Electric Power Companies, who in turn can distribute and retail it for power purposes at low rates to manufacturers. The coke-ovens have become (and their strength in this respect is accruing year by year) strong competitors in the residuals markets that were formerly largely held unchallenged by the gas industry; and the profitable disposal of their gas must make them still more formidable rivals in the disposal of their other residuals. The question of the systematic utilization of coke-oven and blast-furnace gases in the manner referred to here was mooted some time since, and was discussed in a paper read by Mr. Charles H. Merz at the meeting of the Iron and Steel Institute in 1908 which

paper was the subject of comment in the "JOURNAL" at the time (Oct. 20, 1908, pp. 180, 208). There had then been practical work in this direction; and in the meantime a concern—the Waste Heat and Gas-Electrical Generating Stations, Limited—has been largely extending the admittedly useful work of obtaining power from that which was formerly waste. It was only by the establishment of the Electric Power Companies to act as buyers and distributing agents that the scheme became feasible; for colliery and blast-furnace owners were not themselves in a position to put to profitable use all the electrical power that could be generated from the gas produced by them in their ordinary operations. The Company named above merely act as intermediaries in buying, transforming, and selling power; and last year they earned a profit of £16,731, and paid a dividend of 7 per cent., though their projected activities have been only partially developed. The operations of the Company call for large horse-power gas-engines from the makers. These large horse-power gas-engines represent a concentration of numerous smaller ones (or steam plants) that might, under other circumstances, exist in manufacturers' establishments, but the places of which are occupied by the electric motor to utilize the product of the formerly wasted energy. This is all part and parcel of the great march of economy by which the human and the material interests of the world are promoted.

Gas Supply in Sydney during the Coal Strike.

The report of the proceedings at the last half-yearly meeting of the Australian Gaslight Company which will be found in another column, possesses more than ordinary interest, from the fact that the Chairman (Mr. G. J. Cohen) devoted a good portion of his address, when moving the adoption of the report, to the trouble arising from the strike of coal miners in Sydney. In one respect the strike was beneficial to the Company—it caused an increased consumption of gas, which, under ordinary circumstances, would have been gladly welcomed. But inasmuch as the gas was costing more to produce, the extra demand for it could have been dispensed with. The Chairman stated that if the Company had doubled their charge, it would not have recouped them for the enormous additional outlay incurred. But the Directors felt they were in duty bound to keep up the supply of gas; and when their stock of coal began to run low, they did not for a moment hesitate to incur the extra heavy expenditure necessary to increase it. At the date of the meeting (Jan. 27), this outlay had by no means ended. Unfortunately, the Company were not assisted in their difficulty by the consumers—indeed, their task was made harder, for instead of being economical with their gas, they used it all the more freely so as to reserve their coal. However, in spite of the trouble, the Chairman was able to state that there had been no curtailment in the gas supply throughout the city and suburbs, with the exception of a slight diminution in the hours of lighting the public lamps. The action of the miners not only affected the Company financially, but necessarily caused the Directors and officials a great deal of anxiety; and the desire expressed by the Chairman, at the close of his address, to see the early termination of the strike can be quite understood. He and his colleagues are to be congratulated on having passed through the crisis as well as they did.

Gas Profits and the Rates.

The presentation of municipal budgets frequently furnishes an opportunity for the expression of diverse opinions with regard to the time-worn question of "High gas profits and relief of rates *versus* lower charges to the consumers." The advocates of the former policy, of course, base their arguments on the assertion that the ratepayers, as owners of the undertaking, are entitled to some return on the money invested. At Belfast, £12,000 is being handed over to the reduction of the rates; and another £12,000 has been paid into the sinking fund for the new City Hall. This makes £24,000 for one year—a substantial sum, but not enough for the Finance Committee, who "asked for more." So far, however, from acceding to this request, the Chairman has uttered a warning to the various Committees who are always looking to the Gas Committee for assistance "to be more careful in the future." Exactly as to what this may mean, we are left somewhat in doubt; but if the intention should be to give the consumers of gas the benefit of a lower price, and to leave the users of electricity to pay their own rates without any "relief," we should hail the innovation with satisfaction. The soundness of such a policy was, indeed, enunciated by one member, who moved that the proposed grant from the gas funds in aid of the rates be referred back. Really, he put the matter in a nutshell, when he said he would be told the gas-works belonged to the ratepayers; but if they were not paying, would the ratepayers be asked to make up the difference? This question he himself answered—and no doubt accurately—by maintaining that gas consumers would have to make up the difference. Stockport is another place where the same point has been raised in connection with the "budget." A profit of £22,000 has been realized; and of this £18,000 has been handed over in relief of the rates. This is £3000 more than in the preceding year; and one or two of the members expressed the opinion that a reduction in price would be preferable to this large allocation. One member thought it was not right that the large consumers should have to pay so much, and that those who did not use gas should share in the profits. While admitting the importance of keeping the rates down in order to attract industries to the town, he pointed out that high charges for gas were a deterrent in this latter respect. Another councillor, taking the same side, remarked that those who were not consumers were benefiting to the extent of a shilling in the pound at the expense of those who did use gas. These facts were met, as usual, by the argument that the gas-works must be regarded as a commercial undertaking. Capital was invested; and capital must give a certain return to the shareholders, who were the ratepayers of Stockport. As a local paper says, the benefit of the profits cannot be had both ways. This being so, we would rather see the consumers enjoy the full advantage of the excellent results which are obtainable solely through their support of the undertaking.

The Question of the Rates.

The Salford Town Council have determined apparently on the exercise of a spirit of rigid economy; and, as so often happens under such circumstances, there has been a tendency in certain quarters to apply the pruning knife in the wrong direction. This showed itself on the submission of a resolution extending a hearty invitation to the representatives of the Municipalities of Düsseldorf, Cologne, Barmen, and Hamburg to visit Salford during their forthcoming visit to Manchester. An objection was raised to any money being so spent "at a time when the borough was under a financial cloud, and when some of the Corporation workmen had been put on short time." It is gratifying to note, however, that the resolution was adopted; a large majority of the Council rightly determining to show the visitors that hospitality which was showered on the Salford representatives when they visited the towns named last year. If economies are to be secured, there must surely be more fruitful directions than this in which to seek them; and a serious effort is to be made to find these. This is to be done by means of a Special Committee, who have been appointed for the following purposes: (1) To make a careful and systematic inquiry into the expenditure of the Corporation, with a view to ascertaining whether, by the adoption of a well-considered financial policy, its future expenditure may be confined within the limits of the present rate; (2) or what prospect (if any) there is of reducing the rates; (3) to confer with the various Committees, and to report upon the whole subject. The municipal rate is now 7s. in the pound, and the addition of the poor rate brings the total up to 8s. 10d. This figure, though, of course, it is exceeded in certain cases, is a sufficiently high one to cause uneasiness—especially when further increase is threatened. But there is another aspect of the matter. Last year the rateable value increased by £9369, while the expenditure increased by £24,385; and this is a distinctly unsatisfactory position. During the past ten years, the Corporation expenditure has grown from £260,000 to £360,000; but in quoting these figures, it is only fair to point out that of recent years great demands have been made for purposes of education—no less than £41,000 of the additional £100,000 expenditure having been under this head. An interesting item quoted when the subject was brought before the Council was that the rates had increased from 5s. 6d. in the pound in 1889 to 7s. last year, notwithstanding that, whereas ten years ago the contributions from the Corporation trading undertakings only equalled 3d. in the pound, they last year amounted to 12·18d. It should not be too much to hope that good may come of the Special Committee's investigation.

Profit-Sharing in the Electrical Industry.

The workers in the Electricity Department of the Stafford Corporation have for some years shared in the enjoyment of a bonus scheme with the men of the Gas Department. But for the first time, so far as knowledge goes, an Electricity Company has formulated a scheme of profit-sharing for their workers, which promises to be successful. This is the Westminster Electric Supply Corporation, Limited, the Directors of which have long desired to establish, but have always had to regret the impossibility of establishing, a co-partnership scheme on the lines of that inaugurated by Sir George Livesey in the South Metropolitan Gas Company. The reason that has prevented this is stated to be the conditions under which the Company exist, subject to future purchase. If this is a valid reason, then it extends to all British electricity companies. The only thing the Company can do is to provide a scheme that will encourage thrift, and give the men a direct interest in the success of the business. The scheme is a simple one, being this in brief: All regular employees are allowed to deposit any number of shillings up to 5s. each week. Interest is going to be paid half yearly at half the rate of the dividend on the ordinary shares, with a minimum of 4 per cent. Being credited to the account, the interest becomes compound; but any employee may withdraw his money at any time. A deposit of 1s. a week until 1931, it is calculated, will amount at that date to about £100 if the present rate of dividend on the ordinary shares is maintained. At present 85 per cent. of the Company's employees have taken advantage of the deposit fund; the average of the deposits being about 2s. each per week. There is at present a little over £900 in hand on account of the fund; but it may amount to between £20,000 and £30,000 by the end of the Company's term.

Legal Expenses of Local Authorities.

A Bill has been introduced by Mr. Summers, the Member of Parliament for the Flint district, to enable local authorities to contribute towards the expenses of legal proceedings and Private and other Bills involving questions of common interest. In a memorandum attached to the Bill, it is pointed out that in the administration of local government it very frequently occurs that some point of law requires elucidating by a judicial decision. In present circumstances, some one local authority is obliged to bear the whole brunt of such action as is necessary; and, as the decision of a Court of First Instance is seldom sufficient in such a case, the expenses are usually considerable. The Bill is intended to make it possible for all local authorities interested to share the expenses of such a test action, which is carried on for the benefit of the whole community, and so to minimize the burden. As similar cases may arise in the course of proceedings relating to Private Bills and Provisional Orders, clauses are introduced to meet these cases also.

The London and Southern District Junior Gas Association will next Saturday visit the Hornsey Gas-Works. The Engineer (Mr. J. W. Buckley) has extended his invitation to the lady friends of the members; and the inspection of the works may possibly be followed by a musical programme.

Dr. Rostin.—It will interest many of our readers to learn that Dr. Rostin, whose name has been intimately identified with the development of a system of lighting and extinguishing public lamps, has severed his connection with the firm of A. Landsberger, and will henceforth independently devote himself to the manufacture of scientific apparatus for the gas industry, and at the same time will act as Consulting Engineer to the Telephos Company in conjunction with the lighting and extinguishing apparatus invented by Mr. A. E. Broadberry, the Engineer of the Tottenham and Edmonton Gas Company, of which apparatus we hope to have the pleasure of publishing further details at an early date.

Direct Sulphate of Ammonia Manufacture.—Writing in reference to the article on this subject by Mr. G. Stanley Cooper, B.Sc., in the "JOURNAL" for the 22nd ult., Mr. Ernest Bury, of Little Hulton, near Bolton, asks: "Has the author examined sulphate of ammonia from the Otto-Hilgenstock and Koppers processes, whereby the salt is recovered by washing coke-oven gas with sulphuric acid?" Mr. Bury says that since reading the article he has tested a specimen of sulphate from the new Otto-Hilgenstock direct recovery process, and found that it contained neither tar nor free sulphur. The sample which was very dry—having been on hand some time—contained 25·5 per cent. of ammonia; and he points out that since theoretically pure sulphate contains 25·75 per cent., little margin was left for impurity of any kind.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 679.)

THE rush in the Stock Exchange upon highly speculative ventures is now on an increased scale. Rubber and Oil had it to themselves; but a new arrival has made its appearance, in the shape of Rhodesian concerns. Last week these three pretty well engrossed attention; but, on the whole, the high-class departments were none the worse for it. They were rather dullish on the opening day; and Railways were damped by the weather. Consols, however, managed an $\frac{1}{8}$ rise; and the gilt-edged in general were fairly steady. Tuesday rather improved the tone in the best markets, quiet as they were; and Consols had another $\frac{1}{16}$ rise. This attitude was scarcely maintained on Wednesday, and the leading lines were dull and inactive; but in the popular markets affording excitement there was plenty of life. The pendulum swung back on Thursday, and the better class of investments were then stronger. Home Governments were firm. Consols gained $\frac{1}{8}$, and Railways and the Foreign Market were good. Friday, as is not infrequently the case, brought about some realizing, which checked the rise; but Consols again advanced $\frac{1}{8}$ in spite of it. On Saturday, the humdrum departments were quiet, and Consols fell back $\frac{1}{16}$; but the speculative markets were full of life and action. In the Money Market, there was a fair demand, and rates stiffened except towards the close. Discount was harder and closed firm. Business in the Gas Market was more active, showing a recovery up to the level of a week or two ago. The general tone was excellent; and a considerable number of quotations advanced. Some of these were due to announcements of a material increase in the rates of dividend payable shortly—to wit, in British, Ilford, and San Paulo. The only shrinkage was a slight one in Gaslight and Coke ordinary, transactions in which ranged from 104 to 105¼—a fall of ½. In the secured issues, the maximum was dealt in at from 88¾ to 89½ (a rise of 1), the preference at 104¼ and 105, and the debenture at from 81½ to 83. South Metropolitan was firm and unchanged at from 120½ to 122; and the debenture made 82¾. In Commercials, there were only two or three deals in the 3½ per cent. at 104 and 104⅛. The Suburban and Provincial group were really almost lively. Bournemouth "B" was done at 16½ and 16⅝, Brentford old at 251 and 252½, ditto debenture at 101¼, Brighton original at 214, ditto ordinary at 156, British at 43¼ and 43⅜ (a rise of 2), Ilford "B" at 109½ (a rise of 1), Lea Bridge at 121, Portsea "A" at 134½, and Tottenham "B" at 112½ (a rise of 1). In the Provinces, Chester was done at 110, and Liverpool "B" at 167 and 168. In the Continental companies, Imperial was unchanged at from 175¼ to 176½, and European part-paid made 18¾ (a rise of ¼). Among the undertakings of the remoter world, Bombay fully-paid changed hands at 6$\frac{1}{16}$, Buenos Ayres at 15, Cape Town at 3½ and 3¾ (a rise of 1), ditto preference at 5⅝ (a rise of ½), Primitiva at 7$\frac{13}{16}$ and 7¾, ditto debenture at from 99¾ to 101 (a rise of 1), River Plate at from 17$\frac{13}{16}$ to 18, and San Paulo at 15 and 15$\frac{1}{16}$ (a rise of 1¼).

ELECTRICITY SUPPLY MEMORANDA.

Great Expectations—Cost Demonstration at Chichester—The "Deadly Products" Slander—A Suggested Cause for the Bursting of Lamps—Effect of the Metallic Filament Lamps.

THE heavy-priced units are still quantitatively sinking, and the low-priced ones are still ascending. That is the report from several quarters. There is still an attempt in public to put a good face on the position, and to try to convince shareholders that it is all very good business indeed, until some of the latter doubtless go their way wondering whether it would not, under the circumstances, be an excellent thing to drop all the units that bring in the greatest revenue apiece, and rely entirely for the sustenance of the concern and the profit of the shareholders on the low-priced units. Behind the scenes there are in some places wry countenances; and the perpetual inquiry is what can be done to stop this quantitative decline of the heavier priced units, and to make them move upwards again. One of the schemes for effecting this is the Electric Supply Publicity Committee, whose area of operations was originally intended to be limited to London and the suburbs. The Committee have commenced work. They have issued a circular and a poster; and the fact has received, in the aggregate, columns of notices (some with illustrations of the poster) in the electrical press. It requires the loss of all sense of proportion to make the achievement worthy the laudation. The poster is headed: "Electric Lighting for London and Suburbs." Then there is a view purporting to represent a large part of London; and about half-a-dozen times higher than the top of Big Ben's home, there is suspended one metallic filament lamp. This is described as a "giant metallic filament lamp" in one of our contemporaries; and in another it is stated that "over the whole blazes a glow lamp of several billion candle power."

This giant, billion candle-power lamp appears to be suspended by a piece of flex., which seems to be rather a dangerous proceeding, and a trifle suggestive of the work of the odd-job man. Underneath the picture, it says "great reduction in cost now within the reach of everybody." This interpreted means that the great reduction is within the reach of everybody—not the electric light. If the Publicity Committee intended the "within reach of everybody" to apply to the electric light, they bring down

upon themselves the criticism that there seems a great deal of reticence on the part of people to stretch out their arms to take it. The very existence and hoped-for activity of this propagandist Committee point to the difficulty electrical folk have to make people believe all they choose to tell them. If, too, it were true that the cost of electric lighting is now within the reach of all, there would be no necessity for the numerous expedients devised with the view of getting hold of new consumers. The Publicity Committee are trying to extend their purview. To this end, they have sent a circular round to every electricity undertaking in the British Isles inviting co-operation; and the electrical papers have been trying to beat-up interest in the appeal. Does this mean that the Publicity Committee have not got so much support as they expected from the London and Suburban electricity concerns? The extension of operations will be noted by provincial gas undertakings; and if increased gas activity is required anywhere to meet increased electrical activity, it will be forthcoming. The Committee are looking for great things from their operations. One of our contemporaries says: "The Committee expect by their work so to increase the connections of the various undertakings that the concentrated kilowattage will be sufficient to light up London—even in a fog." Good! It is indeed a great expectation. There is one thing we must congratulate the Committee on; and it is that this first poster does not partake of the vulgarly libellous character of those brought out some time ago by the Associated Municipal Engineers. The good those posters did the electrical industry was of a negative character. People merely laughed at the obvious spite underlying the grotesque productions. The money spent on them was entirely wasted.

Dear sedate and philosophic old Chichester—that is to say, during all those weeks when there is not the distraction of Goodwood Races to disturb the normal peacefulness. How thankful the citizens must be to the Electricity Company for coming along, and starting a competition with the Gas Company, which has brought to the surface the keen fighting spirit of the management of the latter concern, and has given the good citizens something fresh to be frequently thinking and talking about. The Gas Company have gained the best of the struggle up to the present; and there is no doubt as to the future. The Electricity Company, naturally, have obtained a few consumers who have for the most part not wholly gone over to them; and these consumers have already found out that electricity at 6d. per unit is not, consumed for lighting under the most approved method of metallic filaments, so cheap as modern incandescent gas-burners with gas at 3s. 6d. per 1000 cubic feet—the practical proof being contrary to electrical profession. One of the best and most attractive of public demonstrations that can be made to bear further witness to this is such as the one carried out in their show-room by the Gas Company's energetic Manager (Mr. T. E. Pye). He has two lamps in the window and also inside the show-room—a metallic filament lamp side by side with a modern incandescent gas-lamp of approximately equal illuminating power, the latter being rather higher in light-giving than the former—and showing progressively, in the diagrammatic manner illustrated in the "JOURNAL" for Feb. 22, the consumption and amount of money actually spent for gas and electricity. The gas-meter is in the show-room window; the electricity meter, by order of the autocratic and courageous Electric Supply Company, in the basement out of sight of the curious. But the Gas Company invite all who like to step down and inspect the truthful recorder of the electricity consumption of the lamps. We have a subsequent diagram to that illustrated by us on Feb. 22; and this continues a tale of consumptions working out in cost (at the prices named) to about 3 for electricity to 1 for gas. For example, the gas consumed from the commencement of the run to Jan. 22 (at 3s. 6d. per 1000 cubic feet) cost 3s. 2d., while the electricity (at 6d. per unit) amounted to 9s. 10d. The lamps being used the same number of hours, there can be no question as to the accuracy of the relation of costs. This is a demonstration that can be carried out by any gas authority having show-rooms on the line of electric cables. The electricity authority cannot refuse to supply, though they may prefer the meter fixed in some out-of-the-way place where it will not come immediately under public scrutiny. But please note that electricity meters are purchasable even by gas companies.

The scurrilities of electrical incompetents—incompetents in the matter of true knowledge concerning gas—continue a feature in the propaganda of the commercial departments of central electricity stations. An example reaches us from Hythe, where, as was seen from the statements of Mr. C. E. Rosevear, the Distribution Superintendent of the Hythe and Sandgate Gas Company, in the course of the paper he recently read before the London and Southern District Junior Gas Association, keen competition is carried on between the two illuminating rivals. A circular has been issued in the district by the Folkestone Electricity Supply Company, in which circular advantage is taken of an accident at the gas-works, which caused a temporary distribution of gas not thoroughly purified, to revile gas in manner peculiar to some electricians' notions of honourable conduct. We will pass over such assertions as that the metallic filament lamp will give four times the light of a carbon filament lamp for the same consumption of electricity, waiting only to say that, if it were true, the average consumption of carbon filament lamps would have been at the rate of 5 watts per candle, which, in the days of controversy when carbon filament lamps reigned supreme for interior lighting, was strenuously denied. And what is more, no electricity consumer is able to show that his accounts, by adopting metallic filament lamps, are 75 per cent. less than they were when he used only carbon filament lamps. The whole of the points dealt with in the circular of the Electricity Company are common ones in such literature; and they have been admirably replied to by Mr. Rosevear, on behalf of the Hythe and Sandgate Gas Company. They have also been frequently handled in the "Memoranda." The point, however, in the Electricity Company's circular, to which again we would specially draw attention is this: Where electricity is used "you experience no headaches in the evenings, resulting from *deadly* products of combustion, as with gas." That is a statement for which there is no foundation; and it is on a par with many other postulatory assertions of electrical engineers. We challenge Mr. Thomas Hesketh, the Managing-Engineer of the Folkestone Electricity Supply Company, to name those "deadly" products of the combustion of gas. The statement is untrue. It is made with the obvious intent to do damage to the Gas Company's business. Slanders of the kind deliberately circulated in order to injure the business of another are not permitted by the law. If Mr. Hesketh cannot give some satisfactory explanation as to the "deadly" products of combustion, then the statement should be withdrawn by him and his Company on whose behalf he acted in the same public manner as that by which it has been circulated. Perhaps he has not heard of the withdrawal of a somewhat similar statement, now some time ago, by the St. Pancras Borough Council, when threatened with litigation at the hands of the Gaslight and Coke Company. The Folkestone Company have also circulated selections from the evidence of certain witnesses before the Board of Trade Departmental Committee on the Metropolitan Gas Supply; but they do not quote any of the rebutting evidence, nor do they say that the verdict of the Departmental Committee (over which Lord Rayleigh presided) was entirely in favour of the Gas Companies concerned in the inquiry. But this is the sort of thing to which electricians have accustomed us. It seems impossible for some of them to fight fairly and squarely, which shows the seriousness of the difficulties with which they have to contend. As they cannot succeed on the question of cost, their policy is to try to frighten householders into evicting gas. In trading, this must surely be the last resort. But they should not forget that the householders they desire to get hold of have used gas, and had experience of it, before the slanderous circulars have reached them; and so they know what value to place on their contents. That is one reason for the slow progress of domestic electric lighting.

Since the fire at Messrs. Arding and Hobbs, at Clapham Junction, there has been a little spasmodic discussion in the open (how much there has been behind the scenes, one cannot judge) as to the causes of the bursting of metallic filament lamps. In the opinion of a lampmaker (writing in the "Electrical Review") the fault lies with the extreme fragility of the filaments, which break when the lamp receives a slight knock, and then join together again, very often making the filament considerably shorter. When the current is switched on, the usual over-shooting takes place, but being much greater by reason of the decreased length of filament, the wires leading into the lamp through the glass stem are fused, causing the glass stem to crack; and in some cases the bulb bursts. "Lampmaker" thinks the cause of the fire following is the falling of hot globules of metal on inflammable material. These globules drop from the leading-in wires, which are of larger diameter in metal-filament lamps than in carbon. It would, in his judgment, be of great benefit to the industry if the metal-filament lamp were standardized.

An interesting statement was made by the Chairman of the St. James' and Pall Mall Electric Light Company, Limited (Mr. Walter Leaf), at the recent meeting of the shareholders, as to the effect of the metallic filament lamp on their business. It must be remembered that the Company occupy an excellent district for cultivating the lighting business. But, in considering the Chairman's remarks, it must also be borne in mind that, in such a district, there must be a limit, which will be reached early, to the power demand; and it can hardly be expected that economy in costs can continue to be made in anything like the same proportion as during a year when new machinery was brought into operation. The revenue for the year declined by £3229, or 2·7 per cent.; while the saving on costs was £3399. On the other hand, it was necessary to set aside an amount for depreciation exceeding the usual provision by about £4500. The number of units sold—9,504,438—was practically the same as in 1908. But (and this is a significant point) in this total there is a loss of about 3¼ per cent. of the higher-priced lighting units, against an increase of about 20 per cent. on the lower-priced power units. The result is a loss on the average price obtained per unit from 3·026d. to 2·95d., or 2½ per cent. The decline in the lighting revenue is due to the steadily increasing supersession of carbon filament lamps by the metallic filament ones. The view of Mr. Leaf is that the new lamp is putting the electrical industry in a more favourable position for meeting the competition of the modern methods of gas lighting. The opinion of the officials is that the Company are only about half-way through the transition from carbon to metallic filament lamps, and that it will take some two years more before the change is complete. So that a further fall of revenue must be anticipated during those years. To meet this in the main, the Company are going to rely on the economies that may be effected, supplemented by a charge from Jan. 1 last of 7s. 6d. per quarter per rated horse power for motors, in addition to the flat-rate of 1d. per unit, in all cases where the work is of an intermittent nature.

LOCAL GOVERNMENT FINANCE.

The Taxation Returns Summarized.

It requires no less than eight Blue-Books to set forth the Local Taxation Returns in their entirety; the final one of the series being appropriately a "Summary and Index." The volumes relating to the financial affairs of Borough Councils (other than Metropolitan Boroughs) and Urban District Councils for the twelve months to March, 1907, were noticed in the "Journal" a few weeks since (*ante*, pp. 229, 293); and the issue recently (as mentioned at the time) of Part VIII., enables us to give the total figures for that year, so far as the statistics are of particular interest to our readers.

This, it may be pointed out, is the final part of the thirty-seventh annual series of returns; and, as before, the local authorities whose financial transactions are summarized include all county councils, councils of municipal boroughs, councils of metropolitan boroughs, councils of urban districts other than boroughs, rural district councils, boards of guardians, the Managers of the Metropolitan Asylum District, the Receiver for the Metropolitan Police District, burial boards, harbour authorities not being commercial companies or private owners, authorities constituted for the purposes of the Unemployed Workmen Act, 1905, parish councils, overseers, and other local authorities who are authorized to levy, or order to be levied, rates, taxes, tolls, or dues, within the meaning of the Local Taxation Returns Acts, 1860 and 1877. The total number of separate authorities coming within this definition who had financial transactions during the year 1906-7 is 25,502—and that is counting only once those of them who made separate returns respecting their transactions in different capacities. Particulars of the sums received and expended by the Metropolitan Water Board in the twelve months dealt with were published in a separate paper; and with one or two small exceptions, none of the sums received or paid on income account by the Board are included in this summary, as no part of their income had been received from "rates, taxes, tolls, or dues." The receipts quoted include the sums received by local authorities from Government grants towards the expenses incurred in respect of elementary education, as well as the gross receipts from water, gas, electric lighting, tramways, and other undertakings carried on by them, and miscellaneous receipts from rents and sales of property and repayments on account of work done for private individuals. Money borrowed to meet capital expenditure is treated separately. Naturally, the expenditure included is such as has been defrayed out of the receipts mentioned. In a footnote, the Blue-Book states that the number of local authorities who had expenditure (other than that defrayed out of loans) during the year 1906-7 in respect of water supply was 1151, of gas supply 218, of electric light supply 235, and of tramways and light railways 153.

The total amount of public rates received in the year under review was £59,557,199, of which 25·9 per cent. was collected in the Administrative County of London. This total exceeded that for the previous year by £1,301,655. At March 25, 1906, the rateable value in England and Wales of the property assessed to local rates was £207,067,675, compared with £202,858,961 in the preceding year. The figure for agricultural land, which is included, is given as £23,701,843, against £23,736,588. The average amount of public rates per pound of assessable value for the year 1906-7 was 6s. 1·22d., as against 6s. 1·2d. in the previous year, or an increase of 0·02d. Calculated on the estimated population, the amount per head was £1 14s. 6d., compared with £1 14s. 1d. for the year before, or an increase of 5d. The Exchequer grants amounted to £20,988,017, or 2s. 0·2d. per pound of rateable value, and 12s. 0·8d. per head of the estimated population.

Turning now to the subject of borrowing, it is seen from the Blue-Book that the loans raised by local authorities during the twelve months dealt with amounted to £20,393,901, which was less by about £4,000,000 than the sum raised in 1905-6. The decrease affected all the more important classes of work for which local authorities borrow, except those coming under the headings of harbours, docks, piers, canals, quays, and water-works. The amount borrowed in 1905-6 for purposes of highways and street improvements was £3,210,627, as against £2,042,443 in 1906-7, or a decrease of £1,168,184. The amount of loans received in the twelve months for gas-works was £358,357, as compared with £486,102 in the preceding year; for water-works, £2,530,891, against £2,527,676; for electric lighting, £1,525,631, against £2,552,827; and for tramways and light railways, £3,194,190, against £3,344,249. In the case of electric light undertakings, it will be noticed, the falling off in the amount received on loans, as compared with 1905-6, is no less a sum than £1,027,196. The amount of loans outstanding (including sums accounted for by the Metropolitan Water Board) increased during 1906-7 by £11,503,583, which, it is pointed out in the Blue-Book, is smaller than any annual increase recorded between the years 1897-8 and 1906-7. Actually, the total amount of loans outstanding at the end of March, 1907, was £494,487,512; and the relative proportions in which this has been distributed over the various purposes for which it had been borrowed, are as follows: Baths, cemeteries, electric lighting, gas-works, harbours, docks, piers, canals, quays, markets, tramways and light railways, and water-works, £262,549,564, or 53·1 per cent. of the total; elementary education, £38,823,208, or 7·8 per cent.; highways and sewerage and sewage disposal works, £91,973,595, or 18·6 per cent.; other purposes, £101,141,145, or 20·5 per cent. Dividing up the amounts still further, £23,550,765 relates to gas-works; £120,559,297 to water-works (including £47,407,029 loans of the Metropolitan Water Board and £1,027,929 to the Derwent Valley Water Board); £28,218,444 for electric lighting; and £30,888,640 for tramways and light railways. The average amount per pound of rateable value, over England and Wales, of the total loans outstanding is £1 5s. 4d. (including the Water Board loans) for undertakings which are revenue bearing, and £1 2s. 5d. for loans for all other works and purposes—the average amounts per head of the estimated population being respectively £7 12s. and £6 14s. 3d. The amount standing at March, 1907, to the credit of sinking and other similar funds applicable to the repayment of such part of the outstanding loan balance of £494,487,512 as was repayable by means of these funds, was £17,353,903.

The total receipts of the local authorities in 1906-7, excluding loans, amounted to £117,898,553. Excluding any charge made by a local authority for gas, water, or electric current used by the authority for public purposes, some of the items are as follows: Gas-works, £7,150,028; water-works, £4,615,664; electric light undertakings, £3,094,989; tramways and light railways, £7,115,789. It is pointed out by the compiler of the statistics that the revenue of tramway and light railway undertakings carried on by local authorities is shown in the returns as having increased from £5,942,127 in 1905-6 to £7,115,789 in 1906-7; while the receipts of electric lighting concerns rose from £2,853,537 to £3,094,989. The total expenditure, excluding loans, was £114,134,274; some of the items of which are: Gas-works: Maintenances and other expenses, £5,066,646; loan charges, apportioned as far as practicable, £1,457,000; total, £6,523,646, or 5·7 per cent. of the total expenditure. Electric lighting (other than public lighting): Maintenance and other expenses, £1,105,746; loan charges, £1,865,210; total, £2,970,956, or 2·6 per cent. Public lighting: Maintenance and other expenses, £2,148,355; loan charges, £25,718; total, £2,174,073, or 1·9 per cent. Water-works: Maintenance and other expenses, £1,742,579; loan charges, £3,371,685; total, £5,114,264, or 4·5 per cent. Tramways and light railways: Maintenance and other expenses, £4,752,967; loan charges, £1,704,505; total, £6,457,472, or 5·7 per cent. of the total.

WATER PROVISIONAL ORDERS FOR 1910.

In the two preceding issues of the "Journal," the principal features of the Water Bills of the session have been indicated. We have now only to deal with the Provisional Orders relating to water supply.

Application is being made by the Barnstaple Water Company for authority to extend their limits of supply so as to include the parish of Instow, in the county of Devon; but the Company are not to be required to supply water within any part of the area of the Barnstaple Rural District Council which is within the limits, except on conditions specifically laid down in the Order. The Company require power to make subsidiary works, to enter into contracts for the sale of water in bulk, to supply fittings, and to lay pipes in streets not dedicated to the public use. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Chelsham and Woldingham Water Company, Limited, are applying for an Order to authorize them to supply water in the above-named parishes, as well as in portions of the parishes of Oxted, Limpsfield, and Titsey. The Company ask for the repeal of so much of the Limpsfield and Oxted Water Act, 1888, as authorizes the Limpsfield and Oxted Water Company to supply water within the portions of the parishes of Oxted, Limpsfield, and Titsey indicated in the Order. The share capital of the Company is not to exceed £20,000, consisting of the original share capital of £7060 and additional capital not exceeding £12,940, inclusive of premiums. The new capital is to be sold by auction or tender. The dividends are to be limited to 10 and 7 per cent. per annum on the original and additional capital respectively. Borrowing powers to the extent of one-third of the capital raised are required. Authority is sought for the maintenance of the existing works, consisting of a well and a pumping-station in the parish of Chelsham and a tank and a covered reservoir in the parish of Woldingham. The rates for the supply of water are to range from 8s. 8d. up to 8 per cent. per annum, according to the gross estimated rental, with an addition of 7s. 6d. for an extra closet and 15s. for a fixed bath. Water sold by measure is to be charged at a price not exceeding 2s. 6d. per 1000 gallons. The Company require to be exempt from supplying with water otherwise than by measure any workhouse, hospital, or large public institution. [*Parliamentary Agents: Messrs. Lees and Co.*]

The East Kent District Water Company require to be empowered to extend their limits of supply to include the parishes of Wootton, Swingfield, Acrise, Poulton, and Houghton Without, in the county of Kent, and to raise additional capital not exceeding in the whole £25,000, with power to borrow to the extent of one-fourth, also to create debenture stock. The dividends are limited to 7 and 6 per cent., according as the new capital is raised as ordinary or preference. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The Order for which application is being made by the South Kent Water Company is to enable them to raise additional capital to the amount of not more than £25,000, and to borrow in respect thereof one-fourth of the amount of the new capital actually issued. The dividend is to be limited to 7 or 6 per cent., depending upon the nature of the capital—the former rate if ordinary, and the latter if preference. Clauses of the Order enable the Company to sell water in bulk to the Mid-Kent Water Company and to supply fittings. Section 46 of the Act of 1889, giving the Company power to supply materials, is to be repealed. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The Sutton District Water Company are applying for authority to extend their limits of supply so as to include the parish of Kingswood, in the rural district of Reigate, in the county of Surrey, maintain the present works, consisting of two pipe-lines, and construct another pipe-line to connect them with a water-tower (not exceeding 60 feet in height) in the parish of Kingswood. The new works are to be commenced, constructed, and completed within the time, and subject to the conditions, prescribed by section 11 of the Gas and Water Works Facilities Act, 1870. Authority is sought to make contracts for the sale of water in bulk. [*Parliamentary Agent: Mr. John Kennedy.*]

The following Orders have been applied for to the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

The Corporation of Aberdeen require authority to construct an impounding reservoir on the River Avon (a tributary of the Spey), in the parish of Kirkmichael, in the county of Banff, and an aqueduct commencing at the reservoir, and terminating in a water-tank to be erected at Kincardine O'Neil, in the county of Aberdeen. Until the completion of the Avon reservoir, the Corporation wish to be empowered to take from the river by means of the other works authorized a quantity of water not exceeding 10 million gallons per day. It is proposed to construct in the same county another tank in the parish of Echt, a service reservoir in the parish of Peterculter, four aqueducts, a number of washout-pipes, and two roads. Power is required to raise a sum not exceeding £1,500,000 for the above-named works and for the general purposes of the water undertaking; to increase the public water-rate within the city; and to make all rates, &c., preferential charges. [*Parliamentary Agents: Messrs. Martin and Co.*]

The Clydebank and District Water Trustees are applying for power to construct additional works, comprising the enlargement of the Burn Crooks reservoir, a catchwater, conduit, or aqueduct, a conduit or pipe-line, an access road, and a road diversion. It is proposed to abandon two reservoirs, a catchwater, a conduit, and an access road authorized by an Order obtained by the Trustees in 1906. The new works are to be completed within seven years from the commencement of the Order. The existing borrowing powers are to be applied for the purposes of the Order. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

The Corporation of Fraserburgh are applying for authority to construct additional works, consisting of an embankment or dam for the purpose of raising and storing the waters of two confluent streams forming a tributary of the stream known as the Water of Fedderate, a service reservoir in the parish of Strichen, filters in the parish of Fraserburgh, three conduits, and a road diversion. The works are to be completed within eight years. Power is required to borrow £2500 for the purchase of lands and servitudes, £47,487 for the various works, and the sum necessary for obtaining the Order—to be repaid, as to the larger amounts, in periods ranging from sixty to thirty years. The other provisions of the Order include the supply of fittings, the sale of water in bulk, &c. One clause sets forth that every person who fraudulently takes or uses water for any other than domestic or drinking purposes is to be liable to a penalty not exceeding £10 for each offence, and to a penalty of £5 for each day the offence continues after conviction. [*Parliamentary Agent: Mr. John Kennedy.*]

The Kirkcaldy Corporation are applying for an Order to enable them to extend the boundaries of the burgh as defined in a schedule; and one clause in the Order provides that, from and after Whitsunday, 1911, the limits for the compulsory supply of water are to be the enlarged area. All the provisions of the Kirkcaldy and Dysart Water-Works Acts, 1867 to 1908, which are applicable to the present limits are to apply to the extended limits. [*Town Clerk: Mr. W. L. Macindoe.*]

Application is being made by the Corporation of Montrose for authority to consolidate their powers with respect to their existing water-works, provide an additional supply, and construct and maintain new works. The present works comprise a number of wells, aqueducts, conduits, &c., and two reservoirs; and power is sought to construct two more reservoirs, a filter-house, and nine aqueducts or pipe-lines—all to be completed within ten years. The limits of compulsory supply are the burgh of Montrose. The Order contains a penal clause similar to the one contained in the Fraserburgh Order, only the penalty is £20 for each offence, with a continuing daily penalty of £5. There are also provisions for the supply of water for other than domestic purposes and for its sale in bulk to local authorities and others. The Corporation wish to be authorized to levy a public water-rate not exceeding 3d. in the pound; also to borrow for the purchase of lands and servitudes £5650; for the construction of works, £16,790; and for mains, conduits, &c., £1950—to be repaid, as to the first-named amounts, in fifty years, and as to the last in thirty-three years. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

SCOPE OF ACETYLENE LIGHTING.*

[So far as one of its authors is concerned, the new edition of "Leeds and Butterfield, on Acetylene," is a posthumous work. It was on this account that the Editor of the "JOURNAL" was prompted to ask the late Mr. F. H. Leeds' collaborator to write a few lines with reference to its scope and purpose, and especially as to Mr. Leeds' share in its preparation.]

THE book does not describe acetylene as a competitor with a supply of town gas wherever the latter is available at a price of not more than 5s. per 1000 cubic feet. Equally efficient illumination of a room is represented as obtainable from coal gas for half the expenditure that acetylene would entail—assuming that incandescent burners are used for both gases. But in such conditions acetylene would use up only two-thirds as much oxygen, and would produce only two-thirds as much heat, as coal gas. In respect of heat production, incandescent acetylene lighting is not greatly inferior to electric carbon-filament glow-lamps; while the latter are fully three times as costly—taking current at 6d. per unit. Even metallic filament lamps do not reduce the cost of electric lighting to that of acetylene; so that the latter is shown to be pre-eminently the cheapest lighting agent for country houses, &c., where a public supply of gas is not available. In the comparisons of cost, allowance is made for renewals of mantles, lamps, fuses, &c., as well as for the cost of acetylene, coal gas, and electricity. Acetylene is not unduly favoured, since calcium carbide is assumed to cost (including delivery charges in a country district) £15 per ton—a somewhat high estimate for present-day conditions. In the former edition of the book (published six years ago), the cost of carbide was taken at £20 a ton.

The present edition contains fully one-and-a-half times the amount of reading matter in the first edition; and a very large proportion of the additions is the work of the late Mr. Leeds. The book, with these additions, would have been published much earlier had not it been decided to include in it an appendix, giving descriptions, with illustrations, of the more important acetylene generators now made in this country and abroad. As these descriptions were practically compiled by the writer of these lines from information obtained in most instances from the makers themselves, while statements of comparative merit and eulogistic phrases were rigidly excluded from the descriptions, much correspondence and expenditure of time were entailed in the preparation of this appendix. Despite the delay thus caused, however, every effort was made to keep the text of the work revised to the date when the final proofs were read—August last.

It is due to the memory of Mr. Leeds to say that no one had followed more closely than he the progress of acetylene from the time of the discovery of the production of calcium carbide in the electric furnace, and that no one had a more exhaustive and sound knowledge of its qualities and potentialities. The results of much of his original experimental work with it, and many of his deductions therefrom and from the work of others, appear for the first time in this new edition of the book, which it was his chief ambition in the later years of his life to make as nearly perfect as a text-book of its character and scope may be. Ἄλλοι κάμον, ἄλλοι ὤναρτο.

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* "Acetylene, the Principles of its Generation and Use. A Practical Handbook on the Production, Purification, and Subsequent Treatment of Acetylene for the Development of Light, Heat, and Power," by F. H. Leeds, F.I.C., for some years Technical Editor of the Journal "Acetylene," and W. J. Atkinson Butterfield, M.A., Author of "The Chemistry of Gas Manufacture." Second Edition, Revised and Enlarged.. London: Charles Griffin and Co., Limited; 1910.

TABLES FOR ILLUMINATING ENGINEERS.*

WE have received a copy of a book of tables, intended for the use of those connected with the lighting industries, compiled by Dr. Wilhelm Bertelsmann, the Chemist at the Berlin Municipal Gas-Works. A great number of the tables relate to photometry; and as the unit adopted is the hefner, it would appear at first sight that they will not be of direct service to English gas engineers. If, however, "candle" is read for "hefner" throughout these tables, the figures may be used in English photometry. The rest of the tables contained in the book are obviously of quite general application.

The book opens with a statement of the photometric dimensions and units as commonly accepted in Germany—viz., the unit of intensity is the hefner, and the derived units are based on the hefner. We must again protest against the German custom of referring to the hefner unit as a "hefner-candle" ("Hefnerkerze"), for the sufficient reasons that it is not a candle, and that it has a lower value than any standard candle. The application of the word candle to the hefner unit by German electricians is responsible for electric lamps being described as of considerably higher candle power than is correct. The book contains a table of factors for the conversion of hefners into English candles

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* "Rechentafeln für Beleuchtungstechniker." By Dr. Wilhelm Bertelsmann, Chemiker an den Berliner Städtischen Gaswerken. Stuttgart, Ferdinand Enke; 1910.

and German standard candles; so that there is no excuse for the practice of referring to the hefner unit as a "hefner-candle." The factors given for the conversion of hefners into English candles and carcels are those settled at the last International Photometric Congress at Zürich, and not the factors more recently proposed with a view to the establishment of a so-called "International Candle."

Next follow a series of tables for use with bar photometers of various types. Distances are stated in centimetres; and in the first table the disc is moved between lights fixed at a distance of 250 centimetres from one another. The second table is for a photometer in which the standard of light is at a fixed distance of 35 centimetres from the disc. The next table is for the case in which the light which is being tested is at a fixed distance of 35 centimetres from the disc, and is, of course, intended only for the testing of lights of low intensity. A useful table is given for the calculation of the mean spherical illuminating power of a source of light from measurements of intensity made at different angles. Then follow tables for calculating the illumination of horizontal and vertical surfaces by sources of light at different distances and different angles. Other tables follow, showing the consumption of gas, and the light afforded, by various types of burners and the distribution of light at different angles from them. Similar figures, based on Herr Bloch's researches, are given for various electric lamps. Next follow some data as to the effect of different globes and screens on lights, and as to the colour of different lights. The results of Féry's determinations of flame temperatures are reproduced. Other tables give the weights of a litre of various gases in laboratory standard conditions—*i.e.*, 0° C. and 760 m.m. dry—the tension of aqueous vapour at different temperatures, the ignition temperatures and the explosive limits of various gases, the melting points of metals and alloys, some specific heats, and the conductivity for heat of certain inorganic substances.

The compilation appears to have been carefully made, and should prove useful to English gas engineers who have the slight knowledge of German necessary to follow the short explanations of the manner in which the tables are to be used.

FITTING OF GAS-FIRES IN HOUSES.

In the "Journal" for Sept. 11, 1894, Mr. F. S. Cripps, in a letter under the heading of "Fair Play for Gas after it Leaves the Consumers' Meters," pointed out the deficiencies, from an artistic point of view, of gas-fittings in comparison with those used for electric lighting; and he laid stress upon the desirability of gas companies taking up the examination and control of fittings on consumers' premises, and manifesting willingness to give advice freely on all matters concerning illumination. A correspondent who has lately turned his attention to the subject of the letter has sent us the following reflections upon it.

There is no longer much complaint to be made on the score of the artistic deficiency of fittings, as they have decidedly improved; and when I say "fittings," I mean gas brackets, pendants, burners, and the like, or what may be termed the ornamental side of a gas company's business. There is, however, one direction in which there is still great room for improvement, and that is in the application—or perhaps I should say the preparation for the reception—of gas-fires. At the present time all gas-fires, when introduced into a house, look like so many after-thoughts—they do not look as if they belonged to the place; and, as a rule, they are either put in a fender in front of an existing grate, or fixed inside the grate-bars. Of course, I am aware that, in the vast majority of cases, at the present time, we are forced to provide that which can either be fitted into the existing grates or stand in front of them; but my contention is that houses should now be built without the ordinary fire-grates, and that a properly designed gas-fire should be substituted for them—the chimney and flues being arranged to suit.

Then, again, the gas-pipes leading to the gas-fire are, as a rule, hideous in the extreme. They are brought to the side of the fender (outside, in most cases), and then, by some crooked pipe or flexible tube, are connected in a roundabout way with the gas-fire, all the fittings to which are designed without any regard to appearances. Why cannot a suitable fitting be designed for standing on the hearth, and the pipe be brought under the hearth and so connected as to be out of sight; the house, when it is first built, being arranged in this way on purpose to take gas-fires—at least, in all bedrooms? The ordinary open grate and mantelpiece arrangement should be discarded, and everything designed to fit in with the requirements of the gas-fire only.

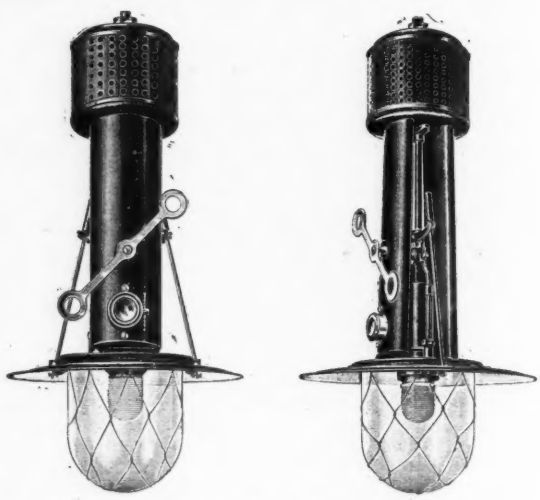
If some of our leading fitting manufacturers, assisted by good architects and artists, would take this matter in hand, there would appear to be an opening for good business in this direction.

Pontypridd and Rhondda Joint Water Board Bill.—The names of Messrs. Torr and Co., Parliamentary Agents, were inadvertently omitted at the close of the notice of this Bill which appeared in the "Journal" last week (p. 570).

THE LUCAS HIGH-POWER INVERTED LAMP.

A Self-Contained (Single-Mantle) Lamp Giving 1200 Candle Power.

Without external aid of any kind, or movable parts within, but by the simplest of all means—an induced draught, with appropriate design and arrangement of lamp parts—the Lucas lamp has attained an individuality and reputation of its own, with a claimed efficiency that is uncontested in point of accuracy. There has been a considerable development by the application of the principle to a specially-designed lamp, with novel features in every part, whereby, with one inverted mantle, an illuminating power of 1200 candles is obtained, and is maintained, with a gas of southern qualities, and with higher efficiencies using the higher grades of gas that are the vogue northwards. But, speaking generally, with the ordinary lower grades of gas, an efficiency of 40 candles is realized per cubic foot of gas consumed by this self-contained lamp; the total consumption therefore being from 30 to 33 cubic feet of gas per hour, according to the composition of the gas. The field of application for such a lamp is therefore a large one, not only for the illumination of extensive open spaces, but for spacious interiors where a source of light of high power is required, and a noiseless source.



The new lamp has been produced by the well-known firm of Moffat's Limited, of No. 13, Farringdon Road, E.C., and in it they have concentrated their considerable experience as to requirements. Before being made acquainted with the construction in detail, the first two things that strike one are novelty in design and the strength of all parts. When in use, there is a constant active cycle of operations going on from head to head, with the effect concentrated in the brilliantly incandescent inverted gas-mantle situated midway in the cycle. Simply described, before going into particulars, from the drum-shaped head of the lamp there depend two ducts, the left-hand one leading to the burner, and the right-hand one connected with the interior of the globe. From the head the left-hand duct draws in the fresh-air supply, and the right-hand one sucks away the products of combustion and ejects them at the head of the lamp—the construction of the head being such that air admission and products ejectment are kept well apart, so that the incoming air shall not be contaminated by the outgoing products, and so cause loss of efficiency. The gas supply is taken by a central tube (provided with a screw regulator) to the burner connected with the mixing-chamber (between the two ducts). The burner is specially constructed, and its air connections designed in such a way, that the primary and secondary air supplies from the left-hand duct are kept absolutely distinct. In the trumpet-shaped bottom part of the burner from which the mantle depends, in place of the ordinary gauze, a honeycomb head is arranged, composed of a bunch of small diameter tubes, about 2 inches long, through which tubes the gas and air mixture is ejected, while outside the bunch, and between each individual tube, the secondary air passes. This is accomplished in this wise: There are connections between the air duct and the chamber containing the burner; and they are independent of each other. The top connection is for the primary air supply; and it is so regulated that the proportions of air and gas are equal—that is to say, a mixture of one and one is formed, so that there is no possibility of an explosive mixture being formed in the burner. Then the lower connection supplies about 4½ parts of air, which flows between the small tubes to ensure complete combustion, and the surplus to support combustion—an incidental advantage of this arrangement being that the cold air assists in keeping down the temperature of the small burner-head tubes. The condition of the mantle shows that thorough admixture of gas and air is obtained; and the same visual proof is all that is required as to the effectiveness of the general arrangement. The secondary air supply passes from the main air duct to the burner through a small nicely balanced aluminium flap-valve, seen through a glass-

faced sight-hole. Should there be any tendency to light-back through any circumstance, the pressure set up forces this flap-valve back on its seat, and so prevents the admission of the air from this channel, and thus any mischief arising from explosion. On normal conditions being regained, the flap-valve immediately opens, and resumes its regular function. The glass-faced sight-hole and flap-valve have their own removable casing, so that the whole is readily withdrawable for inspection or adjustment.

The mantle is suspended on a movable support attached to the burner-head. The mantles are specially made for the lamp, and are uncollodionized. They are no less than 7 inches long before being burnt off, and afterwards are $3\frac{1}{8}$ to $3\frac{1}{2}$ inches deep, with a diameter of $2\frac{3}{8}$ inches; so that there is a large surface of completely incandescent mantle. A test in the show-rooms resulted in the mantle keeping in perfect condition for use during 180 burning hours. The lamp is lighted by a fixed flash-light and lever; and a secondary means is provided should there be any necessity for its use. The finely wired globe is carried by a band, which is supported in a simple but effective way. Passing through holes in the reflector are a couple of rods attached at the lower end to the globe support; and at the other end (slightly expanded for the purpose), there is engagement, as illustrated, in the slotted ends of an arm centrally attached to the gas-supply pipe. On the release of the rods from the slots, the globe is lowered well below the lamp body, so that cleaning, mantle attention, adjustment, and so forth can be carried on with the greatest freedom. In the lamps as sent out, there is a slight curvature in the rods, which acts as a check in lowering the globe. A good, broad reflector not only serves a useful purpose, but it improves the appearance of the lamp. As already said, the lamp is strongly constructed; the casing being of enamelled steel, and the burner of heavy cast brass, so that there should be no question as to an excellent life record. Unquestionably Moffat's Limited have here a most efficient lamp that will do excellent service in the competition with high-power electric lamps.

CALORIFIC POWER OF NEW YORK GAS.

THE report for the past year issued by the New York State Public Service Commission, exclusive of New York City, contains the results of an investigation of the calorific value of the gas supplied by the 93 Companies under their jurisdiction. According to a summary in the last number to hand of "Progressive Age," the average of the 352 tests made was 631 B.Th.U. gross, or 637·8 B.Th.U. for coal gas, 626·3 B.Th.U. for water gas, and 622·3 B.Th.U. for mixed gas. The maximum variation of individual tests from the averages was 15, 20 to 28, and 10 per cent. respectively. These investigations form the basis of conferences which are being held between the Commission and the Companies with the intention of recommending a calorific standard requirement to the Legislature for enactment. It was found that only 20 per cent. of the gas was used for purposes where its luminosity was important.

The report contains a long list of comparative values of calorific and candle-power tests; and the Editor of our contemporary plotted some of them to note the degree of variation. In the figures for coal gas, the results were almost too widely scattered to form even a band; but the trend, if any, might, it is stated, be expressed by the relation B.Th.U. = 75 (c.p. − 8), corresponding to 600 B.Th.U. for 16-candle coal gas. A minimum heat value of 600 B.Th.U. gross per cubic foot seems, our contemporary thinks, to be a popular coal-gas limit, and corresponds to a gas requiring practically no enrichment; thus cutting out the cost of oil and the amount invested in enriching plant. The statutory illuminating power of gas in New York State is 16 candles; and the average of the tests seemed to show that this was obtained with a gas of 625 B.Th.U. The legal requirement of a water gas—20-candle power—was found in gas not lower than 575 B.Th.U.; while the 18-candle power standard of a mixed coal and water gas was obtained with a gas of 600 B.Th.U. Our contemporary remarks that these figures show how complex the problem really is, and how necessary it is to introduce some equitable regulations which shall be more to the advantage of all concerned.

Illuminating Engineering Society.—At the next meeting of the Society, which will be held on the 15th inst. in the rooms of the Royal Society of Arts, there will be a discussion on "Recent Progress in the Measurement of Light and Illumination." In order to make it as complete as possible, some queries on the subject have been circulated, with the view of suggesting a few points on which remarks might be founded. Different forms of apparatus will be exhibited on the occasion.

Southern District Association of Gas Engineers and Managers.—As already announced in the "JOURNAL," the annual meeting of the Association will be held next Thursday, at the Hotel Cecil. We learn from the circular issued by Mr. A. F. Browne, of Vauxhall, who is relinquishing the honorary secretaryship, that the principal business will be the presentation of the report of the Committee, the election of new members, and the delivery of the address of the President, Mr. C. Stafford Ellery, of Bath. At the close of the business, the annual dinner will be held.

THE RATING OF ARTIFICIAL LIGHT SOURCES.

THE interesting question as to the fairest and best method of expressing the true value of light sources has been several times of late referred to. In the January issue of the "Illuminating Engineer," an article was contributed by an "Engineering Correspondent," who alludes to the subject in discussing the determination of mean spherical candle power. It is suggested that in the great majority of cases the total amount of light emitted by a source is of more importance than its value in any one direction, and that this is being increasingly realized. The distribution of the light is alterable by suitable shades or globes, although the total amount of light or "luminous flux" cannot by such means be increased. The mean spherical intensity, or M.S.C.P., of a light source may be defined as the candle power which would be possessed by a source radiating the same luminous flux equally in all directions; and it is regarded therefore as a direct measure of its value as an illuminant. The writer of the article remarks that there are cases—as, for instance, continuous current arc lamps—where the mean hemispherical candle power is a more convenient term, but states that in a number of instances, such as incandescent electric lamps, a constant ratio exists between the M.S.C.P. and the mean horizontal candle power; and such ratios, called reduction factors, may be used for purposes of rapid comparison.

Many who during recent years have followed the technical literature on the subject will have noted the tendency, on the part of some lighting experts, at any rate, to express values of light sources in mean spherical candle power. It is a question, however, whether they will all agree with our contemporary's correspondent that the method best indicates their utility.

The measurement of the mean total luminosity of a light source would at first thought seem to have advantages, since it takes into account every available ray of light in whatever direction emitted; and assuming the possibility by reflection of bringing them all into useful work, the method might be right. In a sense, the argument is a reasonable one, that all the luminous rays are at the service of the lighting expert through the use of suitable shades and reflectors, or by the judicious choice of wall papers. But, unfortunately, shades and reflectors are not always convenient or adequately applicable, and there is even then some loss by irregular reflection and by absorption. The same may be said of walls and ceilings which are seldom or never under the control of the lamp designer. Nevertheless, there are advocates of the method; and the rating of lamps in terms of mean spherical intensity is still in vogue, with consequent comparison of costs on this basis. Reasons are occasionally given for the preference of the system to (say) the hemispherical computation, on the score that, in the latter, reflectors of uncertain and varying quality are, or may be, involved.

On the other hand, now and again suggestions of doubt as to the sufficiency of the method are found in the fact that those who use the M.S.I. method also add the hemispherical data. Two or three such dual comparisons have recently been published through the pages of the "Illuminating Engineer;" and the effect of the different methods on the important question of cost is striking, and warrants the doubt shown. As an example, a table of cost comparison is extracted from a paper contributed to the American Illuminating Society in December, 1907, by Mr. M. C. Whitaker. This gentleman deals with various forms of light sources; but it will be sufficient for the purpose in view to take two or three typical cases as under:—

Light Source.	M.S.C.P. Basis.				M.H.S.C.P. Basis.	
	Cub. Ft. or Watts Per Hour.	Cost Per Hour Per Unit. $	M.S.C.P. of Unit.	M.S. Candles Calculated Per 1 Cent. (Money)	M.L.H.S. C.P. of Unit. $	M.H.S. Candles Per 1 Cent.
Upright gas-mantle .	3·7	0·0037	63	170	51·27	138·5
Inverted ,, .	3·0	0·003	54	180	70·6	235·33
Enclosed arc . . .	600	0·060	213	35·5	329 ,,	54·84
Nernst	264	0·0264	81	30·7	144·3	54·6
16-candle power Edison	55	0·0055	13·2	24·0	11·68	21·78

The doubt in this case is not merely suggested, since, as a matter of fact, Mr. Whitaker explicitly recognizes that the M.S.C.P. basis is insufficient, and he accordingly gives the additional data as being less misleading and calculated to do greater justice to certain types of light sources. The cost figures clearly confirm this view. Such M.S.I. comparisons, whether supplemented or not as above, would seem to bear out "Engineering Correspondent's" suggestion that some lighting practitioners consider the M.S.I. data as adequate bases for comparison.

It is to be hoped, however, that those who use the method (except for theoretical or special ends) are few in number. The method is not an equitable one, and does injustice to the majority of light sources which are in general use. Lamps and burners avowedly employed for varied purposes, and emitting their more valuable lighting rays at distinctly different angles, cannot be judged by their mean spherical candle power value. Their relative efficiency and economy should be computed on a basis which has reference to the conditions of usage. Lamps are bought for

specific purposes; and any lighting expert who knows his business selects them, and their accompanying globes or reflectors, to suit the circumstances of the case. A lamp, for instance, with its horizontal rays at a maximum is chosen for linear illumination, and one with its maximum effect in a downward direction is obviously adapted for floor or table lighting. The rating in M.S.C.P. in such cases is idle and useless, since the serviceable rays are seriously depreciated.

There is, on the other hand, a very strong case for the determination of the value of a light source according to the standpoint of the use to which it is applied. The futility of any other method is probably best indicated by a few instances of various lamps rated both by the spherical and the hemispherical method. The following examples of tests are taken from various contributions on the subject to technical literature. It will be remembered that Mr. Jacques Abady, in lecturing before the Dutch Association of Gas Managers in 1904, dealt somewhat fully with the question of rating, and at that time, being himself an advocate of the M.S.C.P. expression, gave several useful illustrations of light sources so denominated, and methods for their determination.

The following examples are abstracted from his paper to serve the purpose now in view—that of showing the general inadequacy of a M.S.I. denomination as an expression of the value of a light source used for any defined purpose. The mean candle power readings of an enclosed electric arc lamp (500-candle power nominal) and two "C" burners respectively, fitted with "Jena" chimney and squat globe, are given as under:—

Longitudes.	Enclosed Arc.	"C" Burner with Jena Chimney.	"C" Burner with Squat Globe.
90 N.	0	37·0	37·0
67½	33	33·0	41·0
45	19	54·0	33·0
22½	58	76·9	34·5
Horizontal	184	77·0	47·0
22½ S.	203	66·7	75·0
45	211	50·7	76·0
67½	80	17·4	37·0
90	80	0·0	0·0
M.S.I. =	115·3	59·3	50·1
Candles per cub. ft. =		17·0	14·3

The inapplicability of the method to these cases is obvious. In all three instances, the M.S.C.P. fails to express the true value of the lights for any particular purpose. The arc lamp, used either for space or street lighting, has its horizontal rays (which, by the bye, are proportionately higher than is usually found to be the case), and those immediately below the horizontal, distinctly depreciated. The "C" burner with Jena chimney, if employed for street or linear illumination, is robbed of its possible 67 to 77 candle power light by being credited with 59·3 M.S.I. value; while the "C" burner and squat globe, obviously intended for room lighting, is similarly depreciated. Mr. Abady, in advancing these examples, did so to show how M.S.I. values were obtainable; but at the same time he thought the system more equitable than that in which either horizontal or maximum ray values are expressed. Later, as Mr. Abady frankly stated in his lecture to the London Junior Gas Association, he considered the lower hemispherical computation more to the purpose for a general comparison of light sources.

In a paper contributed by Mr. J. Foreman (who is associated with Messrs. Simmance and Abady) to the North of England Gas Managers' Association, a detailed and useful comparison of various lamps and burners was given on the latter basis. In the discussion of lighting efficiencies, lower hemispherical rays were given only, and the rating was made in terms of the respective M.H.S.C.P. of the lamps and burners dealt with. The liberty of extraction is taken, as in the case of Mr. Abady's lecture, for the purpose of indicating how far the M.H.S.C.P. serves to express the value of any light source—that is to say, the value which, judged from the user's point of view, is of most consequence. The lamps chosen are a flame enclosed arc with alabastrine globe, an enclosed arc with clear inner but no outer globe, a Keith 20-inch H.P. lamp, a Welsbach 600 "S.I." lamp, a "C" burner with Jena chimney, a "C" burner with opal comet shade, and a "New Inverted" burner with plain globe.

While the previous examples indicate that the M.S. intensity expression, if applied to all alike, does scant justice to certain lamps, the cases taken from Mr. Foreman's paper show that the value of any light source, as judged by its applicability to definite and specific illumination requirements, is not revealed by even the L.H.S. determination. Take, for instance, the question of street linear lighting, where horizontal rays or those from 0° to 10° S. are desirable for the purpose of illuminating, as far as possible, the street lying between the columns. The M.H.S.C.P. of the flame arc lamp is given as 1342—a figure three times as great as that of the Welsbach "S.I." lamp. On looking at the table, however, it will be noted that the required horizontal rays are almost equal in value—a fact which materially alters the comparison when the cost of current or gas is considered, even apart from that of lamp maintenance.

Where space lighting is wanted, the ratio of the M.H.S.C.P. to the more useful rays is entirely altered, and the comparison as between lamp and lamp is quite different. With the flame arc the mean is below the recorded value of the downward rays, whereas with the Welsbach lamp (using the same reflector as before) it is above it. In the case of the smaller units of light, the illustrations are confined to gas-lamps. So far as the two "C" burners are concerned, those taken are obviously the burners already referred to. The difference between the M.S.I. and the M.H.S.I. computations is striking. Those in the case of the "C" burner with Jena chimney are respectively 59·3 and 56·6; the maximum ray being 77. As to the second burner with shade, the figures are 50·1 and 62·5; the maximum ray being 76.

—	Flame Arc.	Enclosed Arc.	Keith H.P.	Welsbach S.I	"C" Burner with Jena Chimney.	"C" Burner with Comet Shade.	New Inverted at 3·2 Cubic Feet.
Horizontal	600	432	361	615	77	47	52·7
10	760	450	295	575	..	..	50·5
20	1120	460	282	543	..	..	53·4
22½	..	..	..	..	66·7	75	..
30	1520	1180	297	473	..	..	58·5
40	1830	990	232	420	..	..	53·4
45	..	..	..	..	50·7	76	..
50	1750	775	202	360	..	..	52·0
60	1700	680	180	280	..	..	56·8
67½	..	..	..	..	17·4	37	..
70	1680	116	181	210	..	..	52·4
80	1560	45	94	190	..	..	57·1
90	1000	50	105	175	0·0	0	51·2
M.H.S.C.P.	1342	658	267	452	56·6	62·5	54·0
Candles per watt or cubic foot	3·51	1·55	26·46	23·8	16·2	17·86	16·88
Cost per 1000 M.H.S. candle hours (pence)	1·14	2·568	1·13	1·26	1·85	1·68	1·77

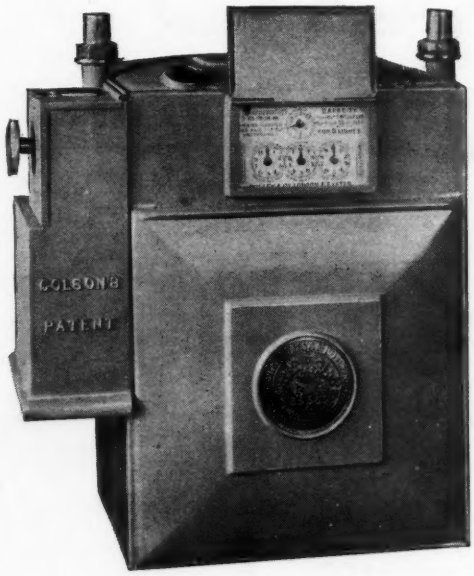
Considering the purposes for which these burners are likely to be required, it is evident that, while the M.H.S.I. determination does greater justice in the second case, it reduces the rating in the first instance; but by neither method is the true value of the burner properly indicated. Referring to the data of the inverted burner, it would seem that the M.H.S.I. computation is a fairly close index of its value; and this is shown by most tests of similarly constructed sources of light. This, in itself, is so far satisfactory; but the fact that so widely different results are obtained in the other cases, when considered in relation to specific ends, suggests that, for all-round purposes of comparison, neither the spherical nor the hemispherical method of rating lamps is adequate for every-day lighting requirements.

Since lamps are used for very varied purposes, and are frequently designed to suit special requirements, there is no necessity to attempt to bring them, even if it were possible, to the same basis of comparison. Lighting practitioners who know their business are cognizant of the kind of lamp which may be suitable for any particular purpose; and it is sufficient for lamp manufacturers to express, as they do at present, the power of their light sources in terms of their best results. For all general purposes, it would seem the fairest, if not the only, way to deal with the matter; and it is difficult to agree with the suggestion that the M.S.C.P. affords a good and direct measure of a lamp's value as an illuminant. The method may be useful from a theoretical point of view; but from that of rating and of cost, it is misleading, and does considerable injustice to many lamps and burners.

At the monthly ballot for membership of the Institution of Civil Engineers last Tuesday, Mr. H. P. Maybury, the Surveyor to the Kent County Council, and formerly of Great Malvern, was admitted a member.

Mr. John Miles has retired from the Board of the Brighton and Hove Gas Company, after 28 years' connection with the Company in the capacity of Director and Chairman respectively; and in the report presented by his colleagues at the recent half-yearly meeting, they testified to the great value of the continuous and important service rendered by him during this long period. To fill the vacancy, they have elected Mr. John Marshall Miles to a seat on the Board, and have appointed Mr. Arthur Matthews Paddon as Chairman.

The annual dinner of the Manchester Association of Students of the Institution of Civil Engineers, at which there was a distinguished attendance, took place last week, under the chairmanship of the President, Mr. J. G. Newbigging. The toast of "The Institution of Civil Engineers" was proposed by Mr. A. C. Dean, and replied to by Sir Alexander Kennedy. Mr. Walter Hunter proposed "The Manchester Association of Students," pointing out that besides this there were Students' Associations in Glasgow, Newcastle, Leeds, Bristol, and Birmingham, consisting altogether of some 760 members. The Chairman, in reply, said the Association had a membership of 156. There was a tendency to municipalize almost every branch of engineering, and it was desirable that municipalities should attract thoroughly trustworthy and competent men to their employ. No institution in the country was doing more to place such men at the disposal of municipalities than the Institution of Civil Engineers. It was true that every branch of engineering was becoming more crowded, and it was more and more necessary for young engineers to find employment abroad. As one who had spent a great part of his life abroad—in the tropics—he could truly say an experience abroad was the finest thing a young engineer could have.



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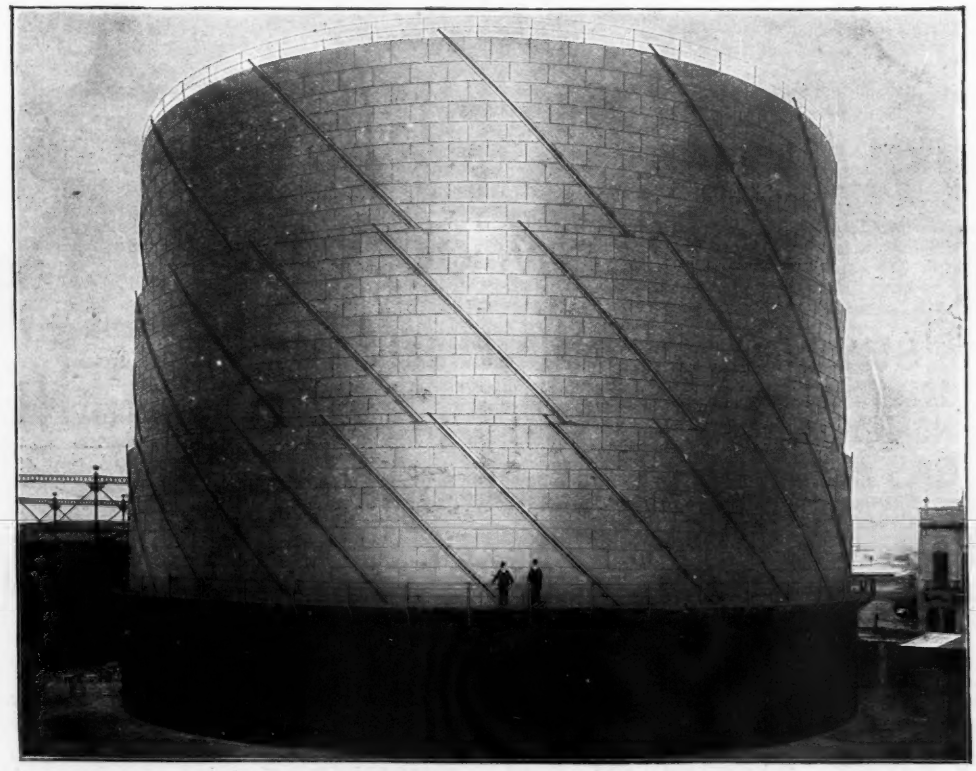

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MIDLAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Birmingham.

The Annual General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham. There was a good attendance of members at the time the retiring PRESIDENT (Mr. W. Langford, of Longton), took the chair.

MINUTES OF LAST MEETING.

The HON. SECRETARY (Mr. Harold E. Copp) read the minutes of the autumn meeting, held in Birmingham, on Oct. 21 last; and these were confirmed, on the motion of Mr. W. C. JONES, of Brierley Hill, seconded by Mr. T. BERRIDGE, of Leamington.

LETTERS OF APOLOGY—MR. HACK AND THE GAS PROFESSION.

The HON. SECRETARY announced that he had received letters of apology from Mr. R. O. Paterson, of Cheltenham, Mr. James Paterson, of Redhill, Mr. J. W. Auchterlonie, of Cambridge, Mr. T. H. Duxbury, of South Shields, Mr. Henry Hack, of Birmingham, and Mr. T. Glover, of Norwich. Mr. Hack, in his communication, stated that some two years ago, when he resigned his appointment at Birmingham, he intended to sever his connection with the gas profession entirely; but owing to the improvement in his health and to other reasons, he had reconsidered the matter, and hoped to be able to continue his connection with the gas profession as well as with the Association. (Applause.)

NEW MEMBER.

On the motion of Mr. A. T. HARRIS (Market Harborough), seconded by Mr. W. J. R. BAKER (Malvern), Mr. Frederick Shewring, of Droitwich, was added to the roll of membership.

THE RETIRING AND INCOMING PRESIDENT.

The PRESIDENT said the time had now arrived when he must relinquish the charge the members entrusted him with twelve months ago, and make place for a worthy successor. It was with very great pleasure that he vacated the chair in favour of Mr. Vincent Hughes, of Smethwick. In Mr. Hughes, they had a man who had lived a strenuous life, who was thoroughly practical, and who, they all felt sure, would do honour to the Association, and his work would be a credit to himself. He (Mr. Langford) had much pleasure in asking Mr. Hughes to at once enter upon his duties.

Mr. VINCENT HUGHES was very heartily received by the members on taking the chair.

The PRESIDENT said his first duty was to propose a vote of thanks to their retiring President. Mr. Langford had told them that he relinquished the office with great pleasure in order that he (Mr. Hughes) might take it from him. It always seemed to him to be an unfortunate thing, in regard to such offices, that just when one had got used to the work, and felt quite at home in it, that one had to give up the position; and a newcomer then came in, and felt quite as strange probably as his predecessor when he took the chair. It was well known that the past year had been a most successful one for the Association; and this was solely owing to the interest and the energy that had been displayed by their late President. He commenced his year of office with an address of absorbing interest. He followed this up with a meeting at Longton, the splendid gathering on which occasion he was sure must be very fresh in the minds of the members, together with the hospitable entertainment extended to them by the then worthy Mayor, who unfortunately was soon after called away from the scene of his activities and good work. But not so well known to all the members was the amount of time and work Mr. Langford had given in Committee. He had been present not only at every Committee meeting, but in other ways he had kept the members of the Committee up to the mark. It was solely owing to their Past-President that the past year had been so interesting and successful.

Mr. J. FERGUSON BELL (Derby) seconded the motion, remarking that they were much indebted to Mr. Langford for the way he had occupied the chair during the year. They remembered the interest in his address, and also the visit to his works at Longton, where they saw most up-to-date plant. Afterwards he took the members to see the coke-oven plant at the works of the Midland Coal, Coke, and Iron Company. He could confirm the President in saying that Mr. Langford had shown great energy during his year of office; and it was due to him that the attendance of members at the meetings had been increased. They had, in fact, had record attendances.

The motion was cordially carried.

Mr. LANGFORD said he thanked the members very heartily for the kind and appreciative manner in which they had received the resolution. To him it had been a very pleasant year. He began with fear and trepidation, knowing well his own limitations, as well as the peculiarity of his circumstances at that particular time. It was due from him that he should testify to the very courteous and kind support he had received not only from the members of the Association, but also from every member of the Committee, as well as to the very great kindness shown to him by their worthy Hon. Secretary (Mr. Copp). He (Mr. Langford) had striven to do his best for the Association; and it had been a work of love. During the year, he visited four kindred Associations, and at their meetings had represented the Midland Association. He was most kindly entertained, and thoroughly enjoyed the visits to the various works. He did hope that the year's work had proved of interest, and had assisted in advancing the interests of the Association. He felt positive if the members by-and-by passed the revised rules which would be submitted to them, that they would have greater interest manifested by the individual members—that was to say, by enlarging somewhat the number of members of the Committee, and making it more representative, they would go along even better than in the past.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Before venturing to address you on other subjects, allow me very sincerely to thank you all for the honour you have conferred upon me in having elected me your President for the ensuing year. As I look back at the names of the distinguished members of our profession who have occupied this chair, I feel it will be difficult to reach the high standard they have set. I must, therefore, ask you to extend to me not only your indulgence but also your assistance; and I know this will not be withheld.

It is very gratifying to me to occupy such a position in this the thirty-third year of the existence of our Association. We embrace a district reaching from the South Coast to Hull, and from the East Coast to North Wales; and as showing the importance of our Association, I may mention that we now number nearly 120 members, who are responsible for the carbonizing of about 3 million tons of coal per annum. The Association was formed chiefly with the object of rendering mutual assistance; and in this direction I think it has more than justified its existence. During the 33 years, much has been accomplished to improve and extend the manufacture and use of gas; and it is pleasant to know that the members of our Association have satisfactorily played their part. It has occurred to me that the short time at my disposal might be usefully employed in reviewing our position, and, if possible, learn something, not only from the successes but also from the failures, of the past, and, further, to improve upon the ideas and aspirations of those pioneers who have gone before and cleared away many obstructions for us.

It is perhaps natural that my thoughts should travel to the past, as it is my privilege and pleasure to have charge of the Smethwick Gas-Works. There is no very ancient history connected with Smethwick; but in the matter of lighting, it stands pre-eminent. In general engineering, Smethwick has always been well to the front—in fact, distinguished by the greatest inventions of the last century; for it was here that Messrs. Boulton and Watt produced their first steam-engine, and for many years we have sent from Messrs. Chance Bros.' glass-works gigantic lighthouses which illuminate the coasts of practically the whole world. But it is with gas lighting that we are more particularly interested; and it is unnecessary for me to remind you that it was at Soho, Smethwick—in fact, on the site adjoining the present gas-works—that William Murdoch effected that triumph in artificial lighting which has so influenced the whole of civilization.

The names I have mentioned above are household words; but by us, as gas engineers, the name of Murdoch should be especially revered. The house in which he lived and died still remains—although in a sadly dilapidated condition—only a few hundrec yards away; and he sleeps in Handsworth Parish Churchyard, about 2 miles from Soho Foundry. The gasholder he first erected is still in use; and it is very remarkable to notice that we continue to follow his methods of construction; the size of the sheets used, and the pitch of the rivets, being exactly the same as in present practice. The holder is 36 feet in diameter by 22 feet deep, and has a capacity of 20,000 cubic feet—quite as large as many built for villages to-day.

It is almost startling to find that the name of William Murdoch does not appear in any patent granted in connection with gas manufacture. In fact, I can only trace that surname once previous to 1860—viz., for a patent granted to a James Murdoch (Feb. 20, 1845), No. 10,532, for "Improvements in the manufacture of gas." The improvements consisted: "First, in causing the gas from coal, on leaving the distillatory retort, to enter a tube or tubes containing an iron spiral, maintained at a cherry-red heat, for the purpose of purifying the gas and for decomposing and converting into gas the tar and essential oils which are mingled with gas;" second, when in combination with the first improvement, the decomposition of water by means of incandescent coke or charcoal for the purpose of obtaining hydrogen gas, &c." I fear James Murdoch found trouble with the first part of his patent; but he was undoubtedly very close to a successful water-gas plant in the second idea.

Having at various periods spent considerable time in searching through patents, I have found it a charming study, not only from an instructive, but also from a historical point of view; and a few notes thereon may prove interesting to you also. I think "Coalite," or some other similar half-bred process, must have received considerable attention for years before gas lighting was introduced,

as numerous patents were granted for partial or slow carbonization. The following are samples.

Aug. 19, 1681, No. 214—John J. Becher and H. Serle grant 14 years for: "A new way of making pitch and tarre out of pit coale, never before found out or used by any other, which, being putt into practice, may be of great advantage to our subjects in general."

Jan. 29, 1694, No. 330—Martin Eele and others, for "A way to extract and make great quantities of pitch, tarr, and oyle out of a sort of stone of which there is sufficient plenty within our dominion of England and Wales . . . . and for breaking grinding and boyling rock or roofe stone."

Aug. 14, 1742, No. 587—Michael Betton and Thomas Betton: "An oyl extracted from a flinty rock for the cure of rheumatick and scorbutick and other cases."

The latter is a point that our "Coalite" friends appear to have overlooked. Perhaps it is the "missing link" to complete the chain of successes.

A somewhat popular idea seems to prevail that such systems as "verticals," "inclines," and "continuous carbonization" are altogether new, and only of very modern introduction. This is a great mistake, as, in many other instances, we are only treading in a beaten track. It is well known to most of you that William Murdoch used vertical retorts at Soho—in fact, I saw them (by the courtesy of Messrs. W. & T. Avery) only two or three years ago. Of course, they were small (about 3 feet high) and direct fired. No doubt the same difficulties were met which we have recently found, and, owing to our want of knowledge or reading, we have had to learn over again that the coke would jamb. In October, 1828, a patent (No. 5712) was granted to John Brunton for an improved retort which was to be "made of a conical (taper) shape for the purpose of facilitating the discharge of the coke at the larger end when the retorts are fixed in a vertical position with that end downwards." Others followed on somewhat similar lines; but the increased make per ton from verticals is specially mentioned in a patent granted to Henry Richard Smith, March 9, 1857 (No. 683), describing the "use of a conical-shaped vertical retort, which shape and position greatly conduces to a more uniform distribution of the heat from the furnace, and thereby effect a thorough conversion of all the gaseous matter with which the retort may be charged, extracting a much larger quantity of gas than can be obtained from the same amount of coal or other matter than is generated in the retorts as at present constructed."

The first mention of inclined retorts that I have been able to trace is in a patent dated May 27, 1851 (No. 13,642), granted to Alfred Vincent Newton (being a communication from abroad). The retort is placed "in such a curved or slanting position that when the lower mouth of the retort is opened at the termination of a charge, the hot coke will slide down into a 'cooling chamber' placed lower also in a slanting position. The charge of coal may be renewed at the upper end of the retort, where a tilt-waggon and rails are provided for the purpose."

Something nearer our present requirements is described in the patent of Aug. 23, 1854 (No. 1854), granted to Aristide Balthazard Bérard—"by distilling the coal in masses of not less than one ton in a cylindro-conical fire-clay retort having its axis inclined to the horizon at an angle of not less than 40° nor more than 60°, and having in its axis a detached or movable perforated pipe by which the gas is withdrawn from the centre of the mass of coal by means of an exhauster, and which perforated pipe is capable of being removed during the operation."

Alexander Angus Croll patented a retort, Jan. 3, 1857 (No. 31), which was not only inclined but also continuous. The coal was reduced to "small particles" and "placed in a closed hopper attached to the upper end of an inclined retort," and admitted into the retort in a gradual and continuous manner by means of a "feeding screw"—the "thin layer or stream being speedily carbonized."

The idea of continuous carbonization was evidently as fascinating to our predecessors as it is to us to-day, and although for nearly a hundred years this object has been kept in view, we have not yet reached the goal.

As early as June 22, 1824, a patent (No. 4978) was granted to John Hobbins, for a "novel construction of retort" and consists "in making the mouthpiece at each end of a separate piece from the body of the retort, which is alone exposed to the action of the fire and thereby becomes the only part that will want renewing; also in the addition to one of the mouthpieces of an opening, which may be closed by a door or valve whereby the retort may be supplied with fresh coals without requiring to open the door, and . . . a corresponding opening to allow of the exit of the coke; also in the introduction into the retort of a rake and a rod at each end through holes in the doors, one of which is for the purpose of discharging the coke and the other for equalizing and spreading the fresh coal." This, I think, must have been the first time separate or detachable mouthpieces were used.

Eleven years later, March 25, 1835 (No. 6799), John Brunton was granted a patent on somewhat similar lines "by which means the retort is kept at an uniformly fulness, introducing and discharging simultaneously bulk for bulk . . . without exposing the interior of the retort to the cooling effect of the atmospheric air, and in a great measure avoiding loss of time, the waste of gas, and the laborious operations necessarily attendant on the usual methods of charging and discharging retorts." At the front of the retort was fixed a hopper provided half way down with a diaphragm. The coal was fed on to this diaphragm, and a rod and screw working through a stuffing-box forced the coal into retort and coke out at other end into a tank with water seal. A somewhat similar arrangement is described in a patent, No. 9070, granted to Luke Herbert on Sept. 8, 1841.

Another idea for continuous charging and discharging is stated in patent No. 7560, dated Jan. 31, 1838, granted to William Holme Heginbotham, who used a kind of archimedean screw running through the retort. The Count de Hompesh appears to have improved on the latter design (see patent No. 9060, Sept. 4, 1841), and recommends that retorts be used of "considerable leugth and small in diameter."

Among other very remarkable contrivances I may mention a revolving retort patented by Henry Pinkus (No. 5541) on Aug. 15, 1827, and which, if I understand it correctly, he also proposed to apply to an ordinary kitchen fireplace. Our old friend Samuel Clegg (patent No. 3968, Dec. 9, 1815) describes a "retort or distilling chamber, flat, circular, about 12 feet in diameter, fitted up internally with perpendicular shaft, to which are attached radiating arms. Shallow boxes are suspended from the arms, and the shaft slowly rotated." The fire was on one side of the chamber, and the boxes gradually turned round from the cool side (where they were taken out and replaced) to the heated side.

John Grafton (patent No. 7788, Aug. 30, 1838) proposed to employ a waggon or carriage travelling the interior of the retort longitudinally to deliver the coals in a regulated stratum equably over the floor of the retort, and to the tail of which waggon is attached a flap turning on hinges, which flap, on being let down, will act as a rake or expeller to push the coke out through the doorway of the retort.

The employment of steam in connection with carbonization is frequently met with; and one of the earliest proposals reads almost like the present Continental method of steaming vertical retorts. John Holt Ibbetson was granted a patent (No. 4954, May 15, 1824) for improvements in the manufacture of gas, in which he describes a "fire-place constructed in the interior of a retort or decomposing chamber, and thereby gives an efficient radiation from its surface and from both sides . . . also in admitting steam into the 'decomposing chamber' when in operation among the ignited coal or coke alone, or mixed with tar or oil. The solution (consumption) of the coak will always be in proportion to the quantity of steam passed through it."

Many other peculiar ideas in relation to carbonizing and kindred subjects have come to my notice; but I will not weary you by describing them. I would, however, like to mention that from about the year 1840 many patents were granted for increasing pressures or "modes of improving gas supply to towns, &c." This was generally to be accomplished by an archimedean screw. A Mr. Charles Carpenter Bompas (April 29, 1828, No. 5644) went so far as to propose using compressed gas as a motive power, by applying it to pistons of engines in the way that steam is used—and, I presume, to consume the gas afterwards.

A method of lighting railway carriages by gas was patented as far back as 1857 (No. 650).

A very beautiful arrangement (quite equal to anything obtainable to-day) not only for lighting gas, but also for opening and closing the cocks (any number) by means of electricity, is described by Charles Cowper (July 22, 1856, No. 1732); and I find several other somewhat similar ideas about the same date.

The following very quaint description of a "portable gas-lamp" is found in patent No. 4381, June 19, 1819, granted to David Gordon and Edward Heard. "This invention relates to a gas lamp or vessel made of sufficient strength to admit of gas being pumped into it under pressure. The vessel may be of any suitable shape and dimensions . . . when in use it may be placed in any convenient position, such as in another room, in a coach, on board ship, &c. The stopcock on the exit-pipe is worked with caution. . . . While the vessel is being charged with gas, it is proper to keep both the pump and vessel cool by means of water." Probably many of you will agree that it would be advisable to use this lamp "with caution."

I will mention only one other lamp, as it has special interest at the present time; an important part of it being very similar to an excellent lamp quite recently placed on the market. It is described in a patent granted to John Braithwaite on Jan. 28, 1847 (No. 11,546). After mentioning improvements in the construction of burner and methods of ventilating, he claims: "Fourth, consists in regulating the flow of air to be heated by the pipe above referred to, or for other heating and ventilating purposes by means of a thermostatic lever." This lever is composed of two slips of metal, possessing different degrees of expansibility, soldered together. "The different degrees of curvature which this lever assumes in consequence of being heated is caused to act, more or less according to its curvature, on a rod and bell-crank, which communicate, by means of another wooden rod, with the air-valve, which is thereby opened or closed as required."

I think I have said enough to show that half-hours in the Patent Office may be very interestingly and profitably spent; that that which is paraded as original and new is often only an old dress re-dyed, and with new trimmings; that many ideas will be found worthy of your consideration; and that probably you will be able to detect just the defect which caused failure and disappointment, and by a slight modification bring success to yourself and benefit to the gas profession generally.

From the days of our childhood we have believed in a close connection between electricity (or lightning) and the powers of

evil. For stage effect, his Satanic Majesty always appears and disappears in an electric flash; and for some years electricity filled us with awe, if not with reverence. But at the present time, although we look on with suspicion, the bogey has ceased to frighten us. It is impossible to deny that electricity has proved one of our best friends, as it was the means of rousing up both sleepy gas managers and directors; and our position to-day is due to the energies and talents thus newly awakened. As a consequence, gas consumers now receive at least ten times the amount of light for the same money.

It is well known that some of us have to meet competition of a very unfair character, when electricity is supplied by companies at ½d. per unit for lighting and power purposes. Of course, it is less than cost price and cannot last long, as even shareholders in electric companies will expect a dividend some day. Probably the most iniquitous thing is where a municipal electric undertaking is run at a loss to suit the caprice of town councillors, and the deficiency is made good at the expense of the gas department. Under such circumstances, a recent decision of the Local Government Board, that both gas and electricity shall be supplied at cost price, is most welcome; and it would undoubtedly be much to the advantage of any town to follow this policy rather than for gas profits to be applied in the reduction of the rates. Take, for instance, a factory rated at £1000 per annum. If the gas profits equalled 3d. in the pound, the manufacturer would get an advantage of £12 10s. on his rates. But such a factory would probably use at least 10 million cubic feet of gas per annum; and if no profits were handed over to the rates, the price of gas could be reduced by 1d. per 1000 cubic feet. This would save the manufacturer about £40 on his gas bill, or (say) three times the amount he gains by having his rates reduced. He would therefore be able to find employment for more hands, and so increase the prosperity of the town generally.

The metallic filament lamps have not resulted in the prosperity electricians prophesied: "The experiences of many users of so-called metal filament lamps are by no means as cheerful as some of the advertising designs would suggest. The extreme fragility of the filament, and the difficulty of its firm suspension in the bulb, have resulted in very short life for these wonderfully 'economical' lamps; and as the price is considerably higher than that of the carbon filament, the actual saving has sometimes been of little advantage." This condemnation is not mine, but an extract from an exceedingly smart publication devoted solely to electricity.

Another competitor which we must not overlook is suction-gas plant. As an economical motive power, this, without doubt, has now for some time been our strongest opponent; and although very satisfactory in many ways, and desirable where cheap town gas is not obtainable, I am convinced that many such plants have been supplied without any, or only a small, advantage to the users, several of whom have informed me that they regret having purchased. The reason for this is that makers of these plants always carefully omit from their advertised calculations the cost of water, which is often a most serious matter. In many factories, too, the carting in of fuel and removal of ashes proves very inconvenient. The ground space required for the plant itself and for storage of fuel is a further difficulty. The greatest trouble, however, arises from the fact that all makers still base their figures on anthracite at about 25s. per ton. It is well known that this is now at least 50 per cent. below the market value; and the probability is that the price will be further advanced. This is only natural, as the anthracite area is very limited; and the owners are all strongly combined, and every additional suction plant increases the demand. Consequently, the owners know that, whatever price they decide to ask for the fuel, must be paid. Of course, gas coal may also increase in price; but we always have the compensation of a proportionate rise in the value of coke and other residuals. Every 1d. added to the cost of fuel, however, either for electricity or suction gas, is a dead-loss to the users of either system.

It always appears to me that the interests of gas-engine makers are identical with our own; but for some inscrutable reason we almost invariably find disparaging statements or comparisons made by gas-engine makers when referring to town gas. Most of us have specially low prices for power gas, in order to extend its use for this purpose; and this must have resulted in the sale of thousands of gas-engines which would probably otherwise never have been made.

While on this subject, I must draw your attention to what I consider a great mistake on the part of gas-engine makers, including the best firms. Owing probably to competition, they have increased the speed of engines and height of compression very considerably, thus enabling them to represent a small engine as of greater power. This, of course, will result in reducing the life of the engine, and also entail additional expense in maintenance. For some years past, Mr. Michael Longridge, the Chief Engineer of the British Boiler and Electric Insurance Company, has pointed out, in his annual reports, that the rate of breakdown of electric motors was about double that of gas-engines. Under the new conditions, I fear the comparison will not continue so favourable.

We have recently witnessed some remarkable developments in gas-engine construction. The three, or multiple, cylinder vertical engines have the advantage of occupying small ground space for great horse-powers; but they do not yet appear to be quite perfect. The latest idea is a continuous firing gas-engine, which is wholly under the control of a specially-arranged governor for graduating the charge according to the load. The result of this is perfect steadiness in running. These engines are now made to great perfection, and will certainly displace the quick revolution high-class steam-engine.

Some years ago, an exceedingly useful and economical appliance was introduced—viz., the "Tangye gas-hammer"—and many of us welcomed it as likely to assist us in our day-load. But for some reason unknown to me we have not heard anything of it for a long time. Probably the cost for gas was then found to be too high; but whereas the price was then about 3s. per 1000 cubic feet, it is now only half that figure. I am convinced there is plenty of room—in fact, a distinct want—for tools of this class; and this gas-hammer was certainly one of the best. Its power was cheaper than that of the gas-engine, and its capabilities ranged from *nil* to a blow of 3 cwt. (but this may be indefinitely extended). The hammer was under most perfect control. The blows were repeated at any rate up to about 120 per minute, and over 4000 blows could be given for 1d. with gas at 1s. 6d. per 1000 cubic feet. In conjunction with the gas-hammer, we should also have gas punching, stamping, riveting, and shearing machines, all equally efficient.

Pumps of the direct-acting or positive type are not much used, and I fear almost unknown. They are, however, very compact and economical in working; and it would often be much more convenient to run a gas-pipe than a steam-pipe, as the loss by condensation in the latter case is enormous. I have in my mind one which was working for some time against 100 feet head of water. This is a subject that should receive more consideration.

During the past year, no important modification has been made in our methods of purification; and in this respect we stand practically in the same position as we did nearly a century ago. Our one aim should be continuous purification, or, as it is sometimes called, purification in closed vessels. It is equally as desirable as continuous carbonization; and if time allowed I could show, from the Patent Office records, how our fathers tried to accomplish this, as in the early part of this address I have pointed out how they endeavoured to arrive at a solution of the other problem. It is a fascinating subject, and worthy of the attention of all of you. There are many difficulties, and I think the successful realization will rest with the chemist and engineer combined. To the popular mind, it is the purifier that is always wrong. As an example, I may quote the following, which I received from an old friend some years ago, addressed "To the Purifying Machine at the Gas-Works:"

> **Oh, ye machine of fickle mind,**
> **To us in future act more kind,**
> **In semi-darkness we sit to-night,**
> **The reason is we've bad gas-light.**

There is always something serious to be expected when one's friends try poetry; and in this case I think the meter was short of water.

Much might be said on conveying machinery, calorific value, carburetting, public and private lighting, slot installations, &c.; but I will only mention one matter in connection with the latter item. I know that some managers who already have a good number of small ordinary meters find a difficulty in obtaining the necessary funds to replace them by prepayment ones. I would therefore remind you that, previous to the introduction of slot meters, I and one or two others adopted a system of weekly collections—using the ordinary meters. It was really prepayment, as the collector called on the consumer on Monday, and received sufficient money to cover the consumption for the week—a kind of railway ticket being used, and a small charge per quarter was made for hire of fittings. There are still many advantages to be shown for this method, as it entirely obviates all trouble of robbery from meters, and no additional expense whatever is entailed for automatic attachments, while the consumer is charged less accordingly.

I have already exceeded my allotted time; but I have tried to take a general review of our position, as I think the elucidation of special fields of inquiry are best covered by papers and discussions in the ordinary way, and I trust that during the coming year there will be an ample supply of such material. I am sure that many of you, even by reciting failures as well as successes, can help forward the interests we all have at heart. But should there be a lack of fresh pabula, I purpose that we shall rediscuss some of the papers read at former meetings—perhaps more mature experience may have modified the views of the authors, and interesting discussions will no doubt follow, and the attractive nature of our gatherings be thereby maintained.

At the close of the address,

Mr. J. H. Brown (Nottingham) said he had great pleasure in proposing a vote of thanks to their President for the very able and instructive address to which they had listened. Those who had known him for some time were led to expect something out of the ordinary. Mr. Hughes combined with his considerable experience an excellent sense of humour; and they had that day listened to not only an instructive address, but to one which was more than usually amusing. Mr. Hughes had not troubled them with any problem connected with carbonizing; but there was no doubt the subject would be dealt with in some of the papers which would follow during his presidential year. Nevertheless he had covered a vast field, and had opened up new ideas, which some of the members had probably never touched upon before. He

(Mr. Brown) was sure he was voicing the feeling of the meeting when he said they were greatly indebted to the President for his excellent address.

Mr. LANGFORD seconded the motion. They had, he said, had from their President an address that was original, comprehensive, and intensely interesting. He felt sure Mr. Hughes would have a very successful year of office; and they all hoped that to him his continuation in the chair would be as pleasant as had been the opening.

The motion was heartily passed.

The PRESIDENT, in his response, said he felt that the complimentary remarks of Mr. Brown and Mr. Langford were somewhat undeserved. When he commenced to prepare the address, he was rather charmed with the idea that a study of the doings of their forefathers would interest the members. He must confess that the farther he proceeded, the more he thought he had made a mistake. However, he still adhered to the path he had set himself, because he thought that although it might be very prosy and uninteresting to the members to sit and listen to a lot of quotations from old patents, in the days to come the facts he had recounted would be useful and instructive. If this was so, he should be more than satisfied.

EXPERIENCES WITH SEMI-VERTICAL RETORTS, AND NOTES ON CARBONIZING SYSTEMS AND RESULTS.

The next item on the *agenda* was a paper by Mr. ALFRED T. HARRIS, of Market Harborough, on the above subject. Before the paper was read,

The PRESIDENT remarked that certain gentlemen had kindly consented to open the discussion on the paper as they were specially acquainted with the carbonizing methods that were to be brought before them by Mr. Harris. Unfortunately two of these gentlemen were unable to be present on this occasion; and had they been with them, he still thought the discussion would have had to be adjourned, because they had alterations to the rules and other questions to consider that afternoon. Therefore, with the members' permission, he would ask Mr. Harris to read his paper, and then adjourn the discussion to the autumn.

The paper (which is published on pp. 659 62) was then read, and points in it were further elucidated by the aid of drawings. At the close of the communication,

The PRESIDENT observed that Mr. Harris had dealt exhaustively, and in masterly manner, with the subject he had taken in hand. The extent of the field covered by the paper pointed to the advisability of adopting the course the Committee proposed in the first instance—that was, to adjourn the discussion to the autumn meeting. In the interval, the members would be able to properly digest the paper; and there would no doubt then be an interesting discussion upon it.

ANNUAL REPORT AND ACCOUNTS.

The HON. SECRETARY presented the annual report of the Committee and the accounts. The former, in the main, reviewed the proceedings of the year. In the concluding lines, the Committee regretted to announce the death of Mr. John Tindall, of Walsall, who was one of the founders of the Association. It was also mentioned that during the year four new members were elected, and one member resigned; the number on the books at present being 111. The accounts showed a balance in the bank of £82 13s.; but the expenditure included the contribution of £40 to the Livesey Memorial Fund.

On the motion of Mr. ADAM COOKE (Oldbury), seconded by Mr. GEORGE HELPS (Nuneaton), the report and accounts were adopted.

DISTRICT REPRESENTATION ON THE INSTITUTION COUNCIL.

On the proposition of Mr. BERRIDGE, seconded by Mr. BELL, the President was appointed District Representative on the Council of the Institution.

REVISION OF THE RULES.

The HON. SECRETARY presented the following report on the above subject:

A Committee Meeting was held at the Grand Hotel, Birmingham, on Thursday, Feb. 17, 1910—the President (Mr. W. Langford) in the chair. The following members were also present: Messrs. Hughes, Bell, Lee, Bird, Webb, Peaty, Pooley, and Copp.

After a full discussion, the following alterations were agreed upon; and it was decided that the same be recommended to the General Meeting for adoption.

That the Association be called "The Midland Association of Gas Engineers and Managers."

The object for which the Association is established is to promote the advancement of the gas industry in all or any of its branches.

RULE 1.—That the Association shall consist of (1) Members and Associates; Members must be Engineers or Managers of gas undertakings or Superintendents of gas-works making 500 millions or more per annum; and Associate Members shall be persons who, by reason of their professional knowledge or experience, are, in the opinion of the Committee, qualified to assist in promoting the objects of the Association, and who shall not be engaged in trade; and (2), Honorary Members, who, though formerly qualified as Members, have retired from active management, to be elected at the discretion of the Committee. All Members to have equal voting power.

RULE 2.—That the management of the affairs of the Association shall be confided to a Committee which shall consist of a President, Vice-President, six* immediate Past-Presidents, Hon. Treasurer, Hon. Secretary, and six* members, any four of the foregoing to form a quorum. The President and Honorary Secretary, for the time being, of the Midland Junior Gas Engineering Association to be *ex-officio* members of the Committee.

RULE 4.—Two elected Members of the Committee and one of the Past-Presidents shall retire annually in rotation, and shall be ineligible for re-election during the following year. Nominations of Office-Bearers and Members of Committee shall be made by two members (with the consent of the person nominated), and be sent to the Honorary Secretary by the 30th of September each year. That at least seven days prior to the Autumn General Meeting, a list of the Members so nominated be posted to each Member, together with printed envelope for reply, which must be returned to the Hon. Secretary within four days, or by the date named on the list. The ballot papers to be opened by two Scrutineers appointed at the autumn general meeting, and the result announced.

RULE 9.—All questions, except those of a personal nature, to be decided by any convenient system of open voting; the Chairman to have a second or casting vote when necessary. Questions of a personal nature to be decided by ballot.

RULE 13.—The annual subscription to be paid by each Member and Associate Member shall be 10s. 6d., payable in advance on the 1st of January in each year.

* These numbers were altered during the discussion (see below).

The rules were considered seriatim; but the discussion, referring to matters of purely domestic interest, need not be alluded to at any length here.

The PRESIDENT, on Rule 1, remarked that for some years past there had been a question as to the election of members of the Association. In certain quarters, everlasting offence had been occasioned by not admitting to membership gentlemen who had occupied positions as superintendents in large establishments. It would be noticed that the Committee now proposed to admit members occupying positions as superintendents of works making over 500 million cubic feet a year. He thought it was a very proper proposal; but he did not think it would embrace more than half-a-dozen gentlemen in the whole district. They were, however, men who would strengthen the Association very much, and just the class of men who were able to work out research problems.

There was considerable discussion initiated by Mr. W. C. Jones, of Brierley Hill (who received a large amount of support), as to adjourning the discussion until the proposed new rules had been circulated among the members. But eventually it was decided to discuss them at once in rotation, and to amend them as determined by the meeting; and then present them complete at the autumn meeting for confirmation in one resolution.

Mr. J. F. BELL, speaking on Rule 1, said it was 33 years since the Association was formed, and during that time there had been no substantial alteration of the rules. There had been great changes in the gas industry; and the Committee found it necessary to make these alterations. The change proposed in Rule 1 would be the means of adding strength to the Association. It was a matter of great regret that applications for membership had had to be refused from gentlemen who would have been a credit in their ranks and a source of strength; and this was an anomaly they now wished to sweep away. The rule, he felt sure, would appeal to the members as being reasonable and fair. There were also members who had retired from the profession; and it would be a grave mistake to lose the benefit of their knowledge and interest in the Association. The Committee had taken steps to retain them. Then there was the question of associate members. They wanted young men in the Association; and they wished to encourage them. He proposed that the first rule be adopted.

Mr. J. T. LEWIS (Wellingborough) seconded the motion.

Mr. W. A. SAPEY (Tamworth) did not like the words "who shall not be engaged in trade," as he thought it might deprive the Association of gas engineers who had left the profession, or who might do so, and engage in trade. He proposed that the words in question be eliminated.

Mr. A. O. JONES (President of the Midland Junior Association) was anxious that under the new rule there should be no interference with the Junior Association. They did not want any part of their talent withdrawn by the wider opening of the door of the Senior Association.

The PRESIDENT assured Mr. Jones that nothing of the kind would happen.

Mr. W. J. R. BAKER (Great Malvern) seconded Mr. Sapey's proposed modification.

Mr. F. J. Bywater (Birmingham), Mr. Fletcher W. Stevenson (Coventry), Mr. George Helps (Nuneaton), Mr. J. A. Harris (Great Wigston), the Hon. Secretary, Mr. H. Haddock (Atherstone), Mr. J. T. Lewis (Wellinborough) and others continued the discussion on Mr. Jones's suggestion and that of Mr. Sapey. The result has already been mentioned regarding Mr. Jones's proposition; and in regard to that of Mr. Sapey, it was decided that the words should remain as submitted by the Committee.

Mr. A. T. HARRIS asked whether the rules were to be made retrospective.

The HON. SECRETARY: That is a point that can be dealt with when the general resolution comes before the members.

Mr. BELL moved the adoption of Rule 2. He considered it desirable that the number of the members of the Committee should be increased.

Mr. LANGFORD seconded the motion, remarking that the addition of six Past-Presidents to the Committee would be of great use to the Association. He thought it was a pity that directly a President retired from office, he should drop out of the administrative work of the Association. What the resolution proposed to effect was to enhance the interest of a greater number in the affairs of the Association.

Mr. SAPEY thought that three Past-Presidents and nine ordinary members would be better than the proposal in the new rule.

Mr. J. A. HARRIS supported Mr. Sapey.

Mr. A. T. HARRIS agreed with the recommendation of the Committee, as he believed it was better that the Past-Presidents should for a period be kept in close touch with the inner working of the Association.

Mr. G. HELPS said the proposition of the Committee appealed to him because it ensured continuity of control.

Mr. W. G. S. CRANMER (Willenhall), Mr. BELL, and others continued the discussion, which ended in the rule being altered so as to provide for four Past-Presidents being continued in office, and for an increase of the ordinary members to nine.

The question of the election of Committee men was then discussed; and the only point that arose from it was a promise that the Hon. Secretary should in future notify members when the time came round for sending in nominations.

The remaining rules were passed; and, on the proposition of Mr. BELL, it was decided that a copy, as amended, should be circulated among the members, and the general resolution for confirmation be brought forward at a subsequent meeting.

This concluded the business proceedings.

In the evening the members dined together; the President being in the chair.

ILLUMINATION.

The Importance of Good Lighting.

Professor Silvanus P. Thompson, D.Sc., F.R.S., on Thursday afternoon delivered, at the Royal Institution, Albemarle Street, the third and last of his series of lectures on the subject of "Illumination, Natural and Artificial." The first two discourses (which have already been noticed) dealt respectively with light and lighting and sources of light; the final one referred to problems of illumination.

In his opening sentences, the lecturer remarked that there was nothing more extraordinary than the inefficiency, from a scientific point of view, of every source of artificial light. The amount of radiation to which the eye was sensitive, as compared with the quantity of energy that was expended in securing it, was ridiculously small. No lamp that he knew of succeeded in turning 12 per cent. of the energy expended into what was useful for the purpose of artificial illumination. The "Magnetite" arc lamp was much more efficient in this respect than the ordinary arc lamp; but there was only one of them in this country at present—and that he had beside him, as he thought his audience might be interested in seeing it working. The interesting point about it was that, whereas in the ordinary carbon arc lamp the light was from the white hot tip of the positive carbon, and was thrown mainly downwards, in the "Magnetite" lamp the light came from the arc itself (which was luminous), and was mainly horizontal. This lamp was intended for street lighting, and was arranged so as not to give a great splash of light right downwards. It was called the "Magnetite" lamp, because this was the material originally employed; but an improvement had been made in the way of mixing this with other oxides.

Some comparisons of cost of different sources of artificial light were thrown on the screen; and one of these gave the cost per 1000 candle-power-hour with gas at 2s. 6d. per 1000 cubic feet and electricity at 4d. per unit. The figures were: Electric flame arc, 1d.; high-pressure gas, 1¼d.; low-pressure incandescent gas, 3d.; tungsten, 5d.; osmium, 6d.; ordinary carbon filament lamps, 1s. 2½d. The lecturer said that these figures were "rather more recent" than some three or four years old which he had previously shown on the screen. He next gave an interesting explanation of the directions in which illumination is distributed from different forms of light. The ordinary upright incandescent mantle, he pointed out, owing to the fact that the mantle was a sort of vertical cylinder, threw the light out sideways all round. Very little was thrown upwards. In the case of the inverted mantle, the distribution of light was wonderfully uniform in the hemisphere below the horizontal. With the Nernst lamp, the maximum light was sideways on the horizontal plane; and with the "Millennium" gas-lamp, the maximum distribution was also sideways—nothing downwards, and practically nothing upwards.

By illumination, said Professor Thompson, was understood the amount of light received on a surface per square inch, or per square foot, or per square yard of that surface. He would take for his purpose the amount of light received on a surface from a standard candle at a distance of 1 foot. This quantity of light would be called 1 candle-foot. Two candles 1 foot away produced 2 candle-feet; but one candle 2 feet away did not produce ¼ candle-foot. A candle 1 metre away produced about 1-11th of the illumination given by a candle 1 foot away. The exact figure was 10·9. The colour of the surface had, of course, nothing to do with this matter. A very great deal depended on the question of illumination; and people should know how bright the light ought to be for comfort in (say) reading. One could read with an illumination of less than 1 candle-foot; and it would not be too bright even up to 5 candle-feet. It was impossible to read, with ordinary eyesight, with an illumination as little as 1-10th candle-foot; and it was hard to do so with 1-5th candle-foot. Of course, this was, after all, a matter which depended upon the sort of type that had to be read. It would, however, be a very good prescription to say that in any place where reading had to be done, in any schoolroom or office where writing had to be done, and in any drawing office, the illumination on the desk or reading surface should never be less than 1½ candle-feet, whether artificial or natural light. In Holland, it was prescribed by law, in the case of certain factories and other places, that the illumination must not be less than from 0·9 to 1·35 candle-feet in our terms. How did this compare with daylight? How much illumination would one, as a matter of fact, receive upon a flat surface when sitting below a window opening to the north, on a bright day? Certainly (unless it was in the afternoon, when darkness was coming on) not less than 3 candle-feet. It might be as much as 4, 5, or 6 candle-feet; and with direct sunlight, it would be a great deal more.

Continuing on this branch of his subject, the lecturer proceeded to give his hearers much valuable information on the lighting of schools, &c. He pointed out that the Medical Officer to the London County Council Education Committee had made a number of observations as to the lighting of some of the schools under his charge; and he had stated that the lighting was bad in a very considerable proportion of cases. The officer did not, however, say what constituted good or bad lighting—what standard he had been going by; and it would have been much more satisfactory, from a purely scientific point of view, if he had stated the maximum and the minimum amount of illumination in the different parts of the rooms he visited. If in a schoolroom, for example, the illumination fell below 1 candle-foot in the back row of desks, that room ought to be condemned. The distance from the window made a difference; and a very great deal also depended upon whether the windows were high. It was important to carry the window to as near the ceiling as possible; for the light which was of value was that which came from the top. It was quite feasible to measure the amount of illumination by photometers; and this was a matter which ought to be put on a better basis. With the instruments which now existed, surely there ceased to be any excuse for architects not knowing exactly what to provide! After attention had been drawn to the Trotter-Edgcumbe photometer, there was shown on the screen an instrument which was invented over twenty years ago for use in schools in Russia.

School and factory inspectors, continued Professor Thompson, should have the means of definitely ascertaining whether the illumination was satisfactory. The law should see to it that a factory, for instance, was properly lighted, so as not to endanger the workpeople's eyesight. All oculists were agreed upon the progressive harm that was caused by imperfect illumination. The increase in myopia while children were passing from elementary to higher grade classes, was thoroughly established by statistics. Damage was, however, done to eyes not only by insufficient illumination, but by the glare of badly-arranged lights; and it was therefore necessary for them to most carefully consider the question of whether the intrinsic brilliancy was endurable or unendurable.

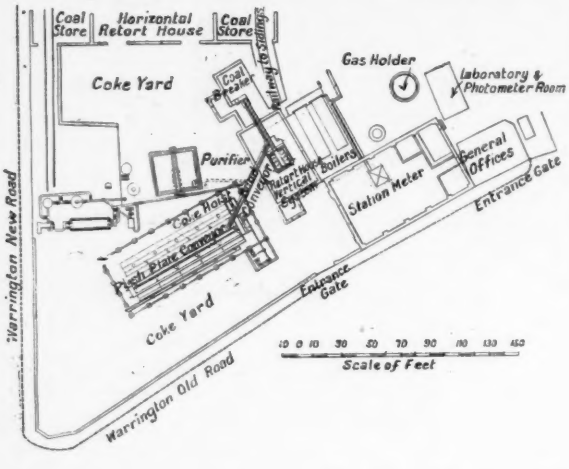
When one could not comfortably endure the brightness from a given source of illumination, how was it possible to scatter the light without wasting it? This had been done in various interesting ways. Light could be diffused by reflection from mirrors upwards, or by refraction from glass surfaces. Something like thirty years ago, Mr. Trotter proposed to flute or rib glass in certain manners for the purpose of scattering the light. The glass was ribbed one way vertically, and the other way horizontally. These dioptric shades had been modified in various manners; and he had on view a number of samples of globes from the Holophane Company. In the illumination of rooms by lamps, it was necessary to discover the laws that governed the illumination which one surface gave another—to find out, not only how much light fell on a surface, but how much the surface gave back. He suggested that a good lamp, generally speaking, would be one which was provided with a mirror above it, and which had a globe with the bottom so ribbed that the light coming downwards would be scattered.

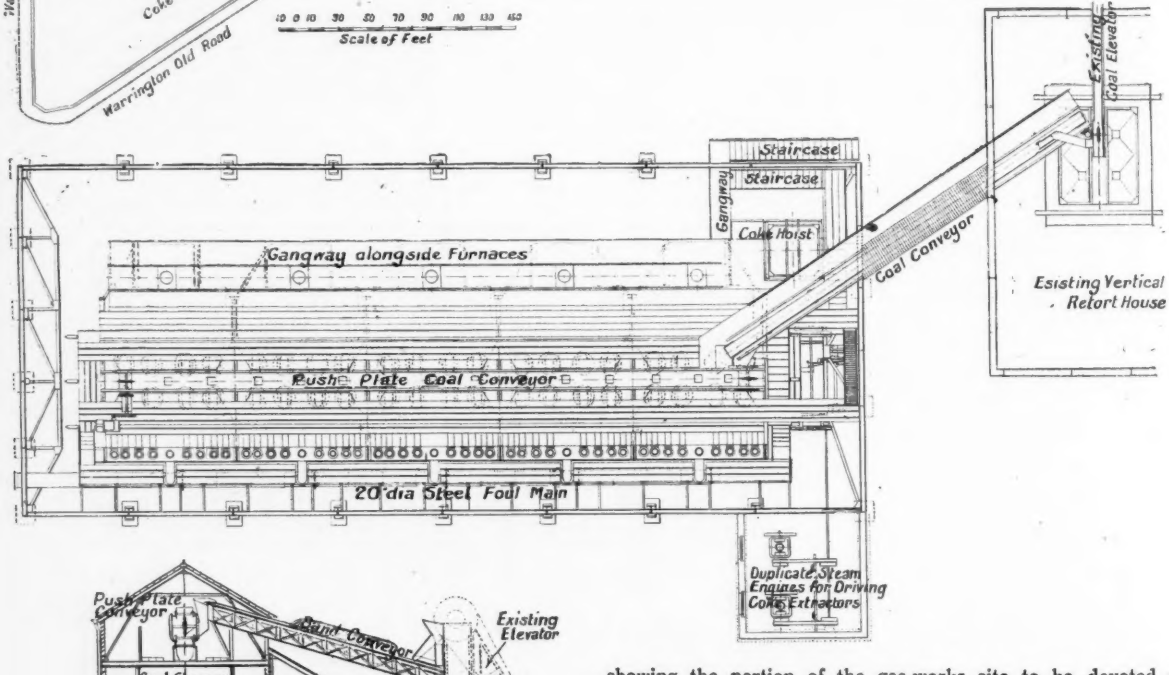
In conclusion, the lecturer remarked that he had tried to show his audience how, by employing artificial devices, to spread, or scatter, or diffuse light so as to guard the eye against glare if the unprotected light was too great. This was, of course, only one of the problems of illumination; there were many others. He claimed that a great step had been taken during the last few years in the improvement of sources of light and in their measurement (particularly by the illumination photometers). In ten years' time, a lecturer would no doubt have many more facts to lay before his hearers on a subject the investigation of which had really only just been begun. There was now an Illuminating Engineering Society which they might fairly expect to look after these matters.

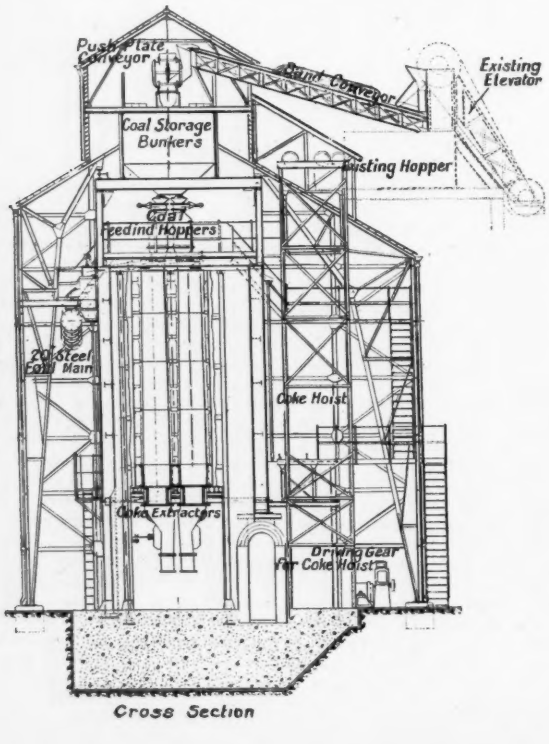
THE EXTENSION OF THE GLOVER-WEST VERTICAL RETORT SYSTEM AT ST. HELENS.

One of the interesting features at the recent meeting of the Manchester Institution of Gas Engineers was the display of a number of drawings by Mr. Samuel Glover, with an extempore description, relating to the projected extension of the Glover-West vertical retort system at the St. Helens Corporation Gas-Works. Then it was a project advised by Mr. Glover, and accepted by the Gas Committee, but awaiting the sanction of the Town Council. To-day, the contractors, West's Gas Improvement Company, Limited, have the mandate of the Council to proceed with the work, in accordance with the proposals the Company have submitted to meet the requirements of the Corporation Gas Engineer. The matter came before the Council last Wednesday; and the recommendation of the Gas Committee was unanimously confirmed, as it was expected it would be. From the very beginning of the working of the original installation of eight retorts (to which working carbonizers for gas production the world over have had their eyes directed), the Gas Committee of the Corporation have been enamoured of the results. They could not be otherwise. Apart from the fact that the setting, though incorporating new principles, has given such little trouble, the results, with the same local coal as used in the horizontal retorts, were of such a superior character that the economy and additional profit appealed to men largely engaged (as are the members of the Committee) in other classes of industry and commerce, as marking an acceptable advance. It is not, therefore, a matter of surprise that they have given—considering, too, that a question appertaining to the site came in—hearty approval to the extension of the system, which in every respect has afforded proof of conspicuous merit.

In view of the fact that the Corporation had not adopted the Gas Committee's recommendation (though there was no doubt as to their acceptance of it) at the time Mr. Glover explained the extension proposals to his *confrères* of the Manchester Institution, it was then a little premature to publish the plans and drawings as a concrete scheme fully authorized for materializing. But now, owing to the endorsement of the Council last week, we are in a position to present our readers with a plan, cross-section, and elevation of the extension settings, together with a ground plan



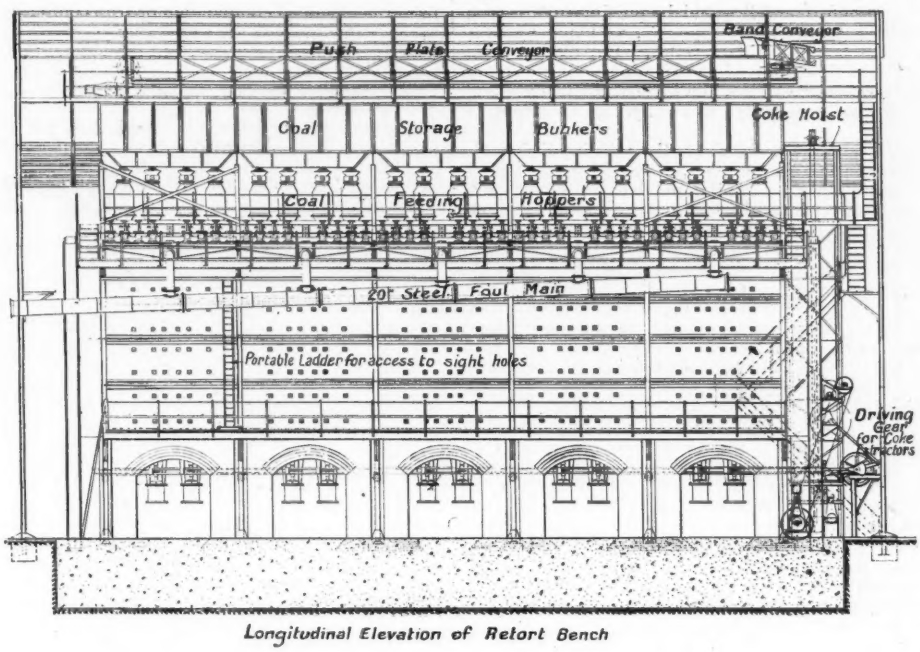




Cross Section

showing the portion of the gas-works site to be devoted to the new plant. The site, it will be observed, is of somewhat awkward shape; and certainly its dimensions would not allow of a retort-house of suitable capacity being erected on any other system. Here we have a point for consideration in the contemplation in other works of carbonizing plant extensions. While this site is not appropriate for retort plant on the older systems, it will admirably accommodate an installation of verticals, the ground space required for which is much less than that needed for horizontals with power machinery. There may be many a piece of ground in other works that can be utilized in similar manner. The point was made when the first setting of eight retorts was described in our issue of June 8 last. It was then remarked: "Owing to the saving in space that can be effected with vertical retorts, the system will enable a large extension of the carbonizing plant to be made within the boundary of the land belonging to the Gas Estate. An additional machine-charged horizontal retort-house would be out of the question; and the present retort-house, with horizontal retorts charged and discharged by West's manual machinery, cannot be extended. If the plan is referred to, a projected extension on the vertical system will be seen. The site represents the little remaining property, within the public roads surrounding the works, belonging to the Gas Department. This is now occupied by the old plunge baths of the town and other buildings. But it will be sufficient to enable an extension of the carbonizing plant to be made on the vertical system; and thus the necessity of going to another site (already secured) will be deferred, as well as the consequent large expenditure."

The proposed installation comprises forty retorts in all, and as the retorts are designed to carbonize 3 tons of coal a day, it may

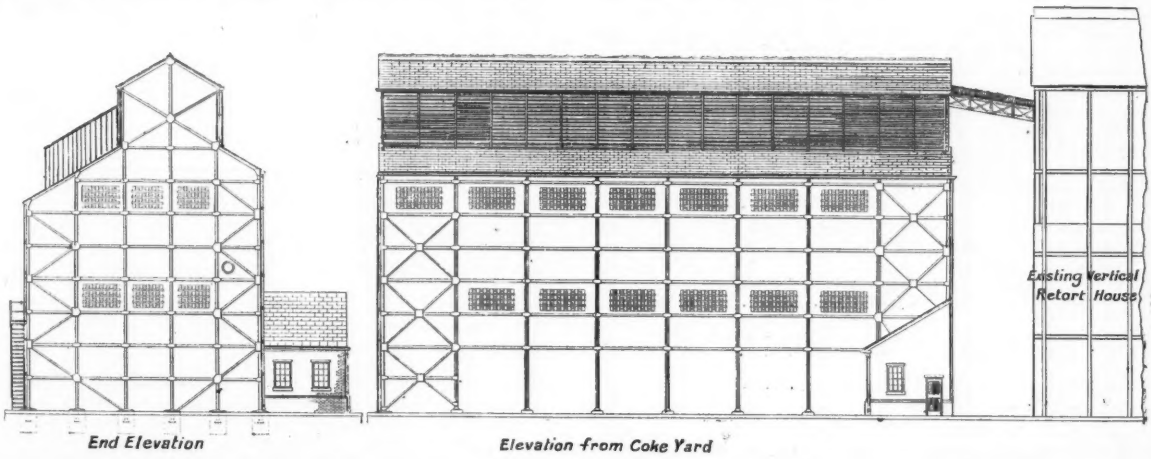


Longitudinal Elevation of Retort Bench

be taken that the new settings will be capable of daily carbonizing approximately 112 tons of coal. Being on the continuous system of working, the quantity of coal dealt with per day per retort can, of course, simply by regulating the rate of discharge, be varied at will. At the Manchester Institution meeting, Mr. J. G. Newbigging mentioned the installation of the system that his Committee are making at the Droylsden works at Manchester; and it is interesting to note that the retorts there are of the same section and capacity as those that are about to be erected at the St. Helens works.

The plans and drawings are self-explanatory; but it may be added that the contract (which is to be completed and the retorts ready for working next winter) entrusted to West's Gas Improvement Company, Limited, embraces the retort-house building, the whole of the materials comprised in the five beds of eight retorts, with retort-bench fittings, discharging gear, firebrick and silica materials, coal-handling plant, storage-hoppers, &c.

Reference has been made to the first published description of the original St. Helens installation (which continues its work without interruption) in our columns on June 8 last. Accompanying that description were the results of working tests with the local slacks and nuts by Dr. Harold G. Colman and Mr. J. E. Blundell. But readers may be reminded that from time to time in subsequent volumes of the "JOURNAL," there have appeared the results of substantial trials made by Dr. Colman (quite independent of control in any way by Mr. Glover or West's Gas Improvement Company) with other, and for gas making the more commonly used, varieties of coal.



End Elevation

Elevation from Coke Yard

THE CAUSES AND RANGES OF VARIATION IN CALORIMETRIC TESTS.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

(*Concluded from* p. 575.)

SIGNIFICANCE OF THE NET CALORIFIC VALUE OF GAS.

THE recent remarks of Dr. C. Vernon Boys, F.R.S., upon the relative value of calorimetric tests stated as "gross" or as "net," are worthy of consideration. Quoting from the "Journal of the Society of Chemical Industry" for Dec. 15, 1909 (p. 1236), he says:

> In taking a net test, the heat due to the condensation of most of the steam, and the cooling of the resulting condensed water to the outlet temperature, was subtracted from the total observed heat; but this did not represent any actual use of the heating power, as the heat given out by the permanent gases in cooling from the boiling-point to the outlet temperature was included in the net value. The figure so obtained was absolutely artificial; it meant nothing.

This valuable opinion may well be divided into two portions: (1) The statement of the worth that attaches to the gross value, and in this the present writer entirely concurs; (2) the statement that the net value is of doubtful worth or utility. As to this, an explanation would appear to be necessary, because only in a rigid and restricted sense can it be said that net value means nothing. Probably if Dr. Boys' views had been more fully set forth, the statement would read as follows: The net value does not correspond to any one chemical reaction or physical change. This would, of course, be correct. Again, the statement that the net value is absolutely artificial, is doubtless correct; but, in the writer's opinion, this is no proof of its being useless. On the contrary, there are good reasons for retaining it—reasons that very likely operated in the minds of those who first put forward the net value, whoever they were.

The factors that come into operation between 100° C. and atmospheric temperature—say, 18° C., the standard temperature of Thomsen's calorific data, or 15·5° C. = 60° Fahr.—are as follows: (*a*) The sensible heat in the nitrogen, oxygen, carbon dioxide, and water vapour forming the products of combustion. (*b*) The latent heat of liquefaction of the same. (*c*) The changes of specific heat of the same. Now, if these three proceeded along perfectly parallel lines throughout this range of temperature, the

matter would be simplified, and it would be possible to attach a simple interpretation to the net value—say, as being all heat available above the boiling-point of water. But although its signification would be definite, yet its estimation would be more difficult than the present procedure, and further would have the disadvantage of not being an index to the hydrogen content of the gas.

As a matter of fact, however, the properties mentioned do not, through the given range of temperature, behave similarly for all components of the products. The principal departure from such uniformity is due to the change of physical state of the water as it is cooled below 100° C. This change involves two factors: (*a*) The latent heat, which at 100° C. is 9660 Cal. for every 18 grammes of water; and (*b*) the change of specific heat by weight from 0·4805 as vapour to 1·0 as liquid. Now, while it is true that similar physical facts would apply in relation to the other constituents of the products, if they were cooled below atmospheric temperature down to their several points of liquefaction, yet as this behaviour is outside normal practical usage, it is not brought into any reckoning of the net value.

Dr. Boys' adjective "artificial" is, to the extent indicated, justified, because "net value" deals with water vapour differently from what it does with the other products of combustion. The justification for that artifice is that water vapour is the only one that changes its physical state within the range of ordinary working temperature; and the effect thereof has a bearing upon the value of a gas in its flame temperature.

The *gross value* is made up of two parts: (1) The heat of combustion of both carbon and hydrogen; and (2) the heat due to change of the physical state of the water produced by the hydrogen. Now, the first may be regarded as kinetic energy put into the products of combustion, capable of raising them to a high temperature, and thus of doing work. But the second does not contribute to rise of temperature; on the contrary, it only makes its appearance at the point of liquefaction. To determine the temperature of a flame—say, in an incandescent mantle—by calculation from its chemical composition, it is permissible only to use the net value, since the heat of liquefaction of the water vapour merely comes into existence at a subsequent stage.

Hence, while *net value*, as now understood, is a convention, yet, when properly defined, it is a most useful quantity. It is, moreover, capable of being ascertained with a high degree of accuracy if the necessary precautions are observed. Further, it is possible to calculate easily therefrom a figure which would represent a definite function, relative to the flame temperature, as will be subsequently explained. The information that gross and net values together give of the chemical make-up of the gas, is worthy of recognition; and it is not desirable that either of them should be abandoned. On the contrary, it will be found that this information, when supplemented by an analysis of the exit gases from the calorimeter, which tells the carbon dioxide, goes a long way towards fixing the quality of the gas, not only as a heating but as an illuminating agent.

The magnitudes of the heat changes from 100° C. to 18° C. of the *exit gases*, when the theoretical air supply is employed for the sample of gas herein adopted, are as follows:—

Latent heat of the water vapour—	
1·7294 grammes × 0·5367 Cal.	= 0·928 Cal.
Sensible heat of the water vapour—	
1·7294 grammes; 82 × 0·831 small calories . .	= 0·068 Cal.

Against an almost equivalent quantity of heat in the inlet gases varying with their relative humidity.

Sensible heat of the carbon dioxide—	
26·02 grammes; 82 × 5·629 small calories (see Section III., Table I., *ante* p. 356).	= 0·461 Cal.
Do. of the nitrogen—	
139·31 grammes; 82 × 33·961 small calories (see Section III., Table I., *ante* p. 356).	= 2·785 Cal.
Permanent gases in exit give a total of	3·246 Cal.

There are thus 3·246 Cal., ± a quantity dependent upon the volume of the air supply and its relative humidity, that would need to be further deducted from the net value as ordinarily ascertained, to obtain a value that should represent the utility of the gas for all purposes where the products of combustion escape gaseous at 100° C.

We must now ascertain what is the amount at present deducted for the water which is condensed within the calorimeter, produced by the combustion of hydrogen. In the example chosen, this water as vapour occupies 1·24 cubic feet, and yields to the calorimeter heat as follows:—

	Calories.
Sensible heat—	
26·94 grammes × 82° = 2209·08 × specific heat of 1 .	= 2·209
Latent heat at 100° C —	
26·94 grammes × ·5367 Cal. latent heat per gramme .	= 14·459
Ordinary deduction from gross to obtain net value . .	16·668

From this we learn that the heat in question for the whole of the products is 16·668 + 3·246 ± *x*, or approximately 20 Cal. and that about five-sixths of the same is covered by the present practice, while about one-sixth is not assessed. But, strictly, the sensible heat equal to 2·209 Cal. should be further considered. It represents the heat capacity of the water after it has become liquid—viz., when its specific heat is 1, as against a specific heat 0·4805 in the state of vapour. For it is only the difference between these two specific heats that, by a strict interpretation, should be included in the total attributed to physical change as distinguished from the chemical combination or true combustion. The figures showing this division are as follows:—

2209 × sp. ht. 0·4805 . .	= 1·0615 Cal. sensible heat as vapour.
2209 × sp. ht. inc. 0·5195.	= 1·1476 Cal. additional sensible heat as liquid.
Corrected total heat change due to liquid state . .	= 14·459 + 1·147 = 15·606 Cal.

The deduction for net value would thus, on a strict basis, be 15·606 Cal., in lieu of 16·668 Cal., or 93·64 per cent. of the present practice, as applied to this particular sample.

The following shows the same principle applied to hydrogen:—

		Calories.	Percentage of Gross.
2 grammes at 18° C. burnt, and products cooled to 18° C..	=	68·360 ..	100·00
Deduct from ditto—			
Latent heat at 100° C. . . 9·660 Cal.			
Sensible heat as liquid at 82° C. 1·476 ,,		11·136 ..	16·29
Present practice for calculating net value .		57·224 ..	83·71

The alternative estimation of net value would be as follows:—

	Calories.	Percentage of Gross.
Gross value as before	68·360 ..	100·000
Deduct from ditto—		
Latent heat at 100° C., as before. . . . . 9·660 Cal.		
Sensible heat of liquid in excess of that of vapour (1476 × 0·5195). . . . 0·767 ,,	10·427 ..	15·253
Alternative net value	57·933 ..	84·747

That is, a consistently computed net value would have a figure as to the hydrogen content of 84·747 per cent., against 83·71, or 1·037 per cent. higher than by the present practice. This does not appear to be a sufficient difference to justify an alteration of the existing rule, which is applied throughout the civilized world. But if, as Dr. Boys points out, a strictly scientific statement is desired, then it can easily be ascertained by calculating 15·253 Cal. for every 16·29 Cal. at present returned. In the example of coal gas, the disparity is 16·668 — 15·606 = 1·062 Cal. in one aspect of the case, and about 3·246 Cal. in another. The former can be easily adjusted from the present system of returns, if exact comparisons are desired; while the latter is disregarded both in the existing and the alternative method. Continuing to ignore it is justified by the difficulty of ascertaining its exact magnitude, and by the absence of any utility when the figures are found, either precisely or approximately. In other words, the existing rule as to determining the net calorific value from the gross is in accordance with a definition which is intelligible, and which if carried out with accurate data, yields results that are useful.

The French practice of speaking of the net value as that with water as steam, and the gross as that with water condensed, carries, upon the face of it, the explanation, which includes no reference to any method of using the gas, or realizing the heat below 100° C. It is possibly through the introduction of the latter conception that misunderstanding has arisen. The factor of 1·86 Cal. per cubic centimetre of water collected for the condensation value, as in the Gas Referees' "Notification," would become 1·74 Cal. if the alternative method described were made use of for any purpose.

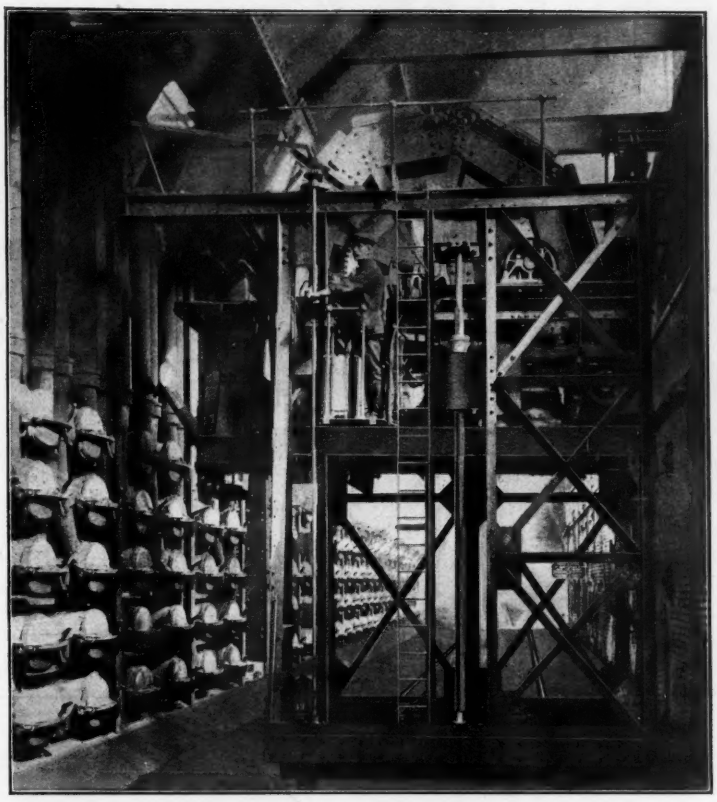
Masonic.

In consequence of the serious illness of Bro. John Mackay, the W.M. Elect of the Northern Star Lodge, No. 3053, the Installation Meeting, which should have taken place on the 25th ult., was postponed (by dispensation) until Friday last. Bro. Mackay, however, was still unable to attend; and, consequently, W. Bro. Wm. Batt was continued in office until Bro. Mackay's recovery to assume the position to which he was elected. The officers appointed for the ensuing year were: Bro. G. B. Smedley, of Swadlincote, S.W. Illness, however, prevented him attending to be invested. Bro. H. Barker, of Buxton, was invested as J.W. W. Bro. J. W. Scott, of Stockport, was appointed Chaplain, but was not present to be invested. The Treasurer and Secretary were re-appointed—namely, W. Bro. Walter Whatmough, of Heywood, in the former office, and W. Bro. R. G. Shadbolt, of Grantham, in the latter. The other officers were: Bro. Fred. J. West, of Manchester, S.D.; Bro. S. Meunier, of Stockport, J.D.; W. Bro. William Prince, of Stoke-on-Trent, D.C.; Bro. T. W. Jordan, of Stockport, Organist; and Bro. James M'Ewan, of Manchester, I.G. The Stewards were: Bro. S. E. Halliwell, of Littleborough, Bro. E. O. Watson, of Rawmarsh, Bro. E. J. Wellens, of Hebden Bridge, and Bro. John Bond, of Southport. W. Bro. S. R. Ogden, of Blackburn, was re-appointed Charity Representative. The annual banquet was subsequently held; W. Bro. Batt, who occupied the chair, being presented with the Past Master's Jewel as a slight acknowledgment of his services during last year.

Mr. A. Scott, who has been Manager of the Markinch Gas Company for 36 years, has tendered his resignation. The Directors have accepted it with regret, and have voted him a retiring allowance.

The number of the "Journal des Usines à Gaz" for the 5th inst. contains a notice of the life-work of M. Emile Leclerc, whose death, at the age of 73, occurred early last month. Deceased was the Engineer of the Compagnie Centrale du Gaz, of Paris (Lebon et Cie.), and was President of the Société Technique in 1885-6.

THE FIDDES ALDRIDGE



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HIGH-PRESSURE INCANDESCENT GAS LIGHTING FOR MILLS.

The Weaving Room at the Blackstaff Company's Factory, Belfast.

[Photograph taken by Incandescent Gaslight.]

THE Blackstaff Flax Spinning and Weaving Company, Limited, of Springfield Road, Belfast, are now well into their second season's experience with high-pressure incandescent gas lighting. The pressure is raised to 55 inches by means of a rotary blower; the drive being taken off the shafting in the mechanics' shop attached to the mill premises. The blower is in duplicate, for prudential reasons—both being supplied by the James Keith and Blackman Company, of London.

The three interesting photographs accompanying these notes (recently taken by Mr. A. R. Hogg, of Trinity Street, Belfast) show how clear and penetrating the light is, and amply justify the high opinion held by the Company of this system of gas lighting. The principal portions of the premises lighted are spinning rooms Nos. 2 and 3, the winding room, reeling room, and weaving sheds. These apartments were formerly lighted by 809 No. 7 (Bray) flat-flames, which have now been replaced by 594 high-pressure incandescent burners, of either 150 or 100 candle power.

The consumption per No. 7 Bray union burner may be taken as 7 cubic feet per hour at 15-10ths. The pressure in some parts of the building might be more, and in some parts less. Some of the burners, again, would be more worn than others. The illuminating power per burner, for 7 cubic feet per hour, may be assumed to be 2·75 candles per cubic foot = 19·25 candles per burner. Taking these figures as a basis for calculation, the following results are obtained:—

Number of No. 7 Bray burners	809
Total consumption per hour	5663 cubic feet
,, cost per hour (at 1s. 9½d. per 1000 cubic feet)	10s. 1¾d.
,, illuminating power	15,573 candles
Cost per candle per 1000 hours	7·8d.

The 150-candle power burners consume 2½ cubic feet, and the 100-candle power burners consume 2 feet per hour each. The actual figures from practical working at the Blackstaff Mill are a fraction under the above. The results shown on next page are therefore obtained.

The Spinning Room. **The Reeling Room.**

Number of 150-candle power burners	308
,, ,, 100 ,, ,, ,,	286
Total	594
Total consumption per hour	1342 cubic feet
,, cost per hour (at 1s. 9½d. per 1000 cubic feet)	2s. 4·8d.
,, illuminating power	74,800 candles
Decrease in gas consumed	76·3 per cent.
Increase in illumination	481·0 per cent.
Cost per candle per 1000 hours	0·38d.,

or 1-20th the cost of flat-flame burners.

With regard to the photos, Mr. A. M'I. Cleland, the Superintendent of Mains of the Belfast Corporation Gas Department (to whom we are indebted for them, as well as for the accompanying notes), says he can state from personal knowledge that they are absolutely unfaked, and that they were taken at 6 p.m. on a November afternoon.

FLOW OF GAS THROUGH PIPES.

By G. F. L. Foulger.

It is idle to make any experiments except upon conditions which can be absolutely reproduced; and I hardly know of any suitable location for such experiments upon an important scale, except (say) the long, straight road between the Beckton Gas-Works and Canning Town, where probably some 2 or 3 miles of perfectly straight pipe could be installed with the necessary plant for testing the flows under different pressures. It is possible that the Governor of the Gaslight and Coke Company might grant some such facilities; and such experiments would be invaluable to the whole of the gas industry, which might contribute to the cost of making them.—*From a letter by Mr.* H. E. Jones *to the* "Journal" *for Feb.* 15.

I am sorry that the letter by Mr. H. E. Jones, from which the above is a quotation, has not drawn forth some notice in your columns; for the subject generally and his proposition in particular are both of great technical importance to gas engineers. I do not think Mr. Jones, in the quoted paragraph, is referring in any way to the existing large high-pressure mains belonging to the Gaslight and Coke Company between Beckton and Canning Town, but has alighted upon this particular three-mile length of road as being the Company's property, and as specially suitable to the temporary installation of a new and independent main which could be worked on all-fours with ordinary district mains, but from which no definite records are at present available over such a length, in consequence of the complication created by cross-connections, &c., in actual practice. A new main such as that proposed, would, of course, be quite unfettered in this direction.

Regarding Dr. Pole's tables, personally I have always found them fairly borne out in practice, always allowing for the fact that the Doctor's formula was intended to apply to new, and therefore clean, pipes, and drawn down to *nil*, so far as pressure is concerned. I have frequently been approached by colleagues in regard to this matter, and have had complaints that the tables are not accurate. It is largely a question of changed conditions, to which formulæ, as other things, are subject. At the time that Dr. Pole compiled his tables, gas pressures were only required to be 10-10ths at night and 6-10ths during the day. These are still the legal pressures; but they are quite useless for modern conditions. Pressures should not now fall below 17-10ths at any point of a gas-supply district to effectively deal with incandescent burners, stoves, and gas-engines, either night or day. Consequently, the points for consideration regarding the carrying capabilities of mains are now: (1) What gas can be delivered between the starting initial pressure and the leaving-off pressures, and (2) what the latter must be. These leaving-off pressures to-day are in practice in excess of what Dr. Pole had to consider as an initial pressure. This fact—the product of changed conditions—leads some engineers to doubt the accuracy of the tables, as due regard is often not paid to what the mains could do if it were permissible to draw the pressures down as of old. In other words, the pipes could pass more gas if present conditions did not negative the possibility by having no less than 17-10ths useless pressure for carrying the supply, but absolutely necessary pressure for the new-condition supply.

My remarks apply more particularly to district pressures. Dr. Pole's and other published tables refer, as a general rule, to pressures between 1-10th and 20-10ths, with the usual reference as to doubling the inital pressure to increase the output by 50 per cent. If one wanted to double the output through certain pipes, one could do so by working four times the initial pressure. High-pressure main delivery, however, does not so closely bear out Dr. Pole's theory; and I doubt if he so intended, or, in fact, troubled himself beyond the then existing conditions. My opinion is that, with high pressure and great velocity, friction is set up which, in effect, produces a band of stationary gas round the inside of the pipe—thus reducing the space for the travelling cone of gas in the centre. I want to make myself clear on this point. Boating men and river fishermen are familiar with the fact that, in a fast stream, an eddy is set up in the opposite direction to the flow by the friction along the banks; and the faster the stream, the more pronounced is this. Now if this condition is produced by contact with the banks, how much more must the same condition apply inside a circular pipe, where the like action necessarily takes place all round. Assuming this return eddy action of gas in mains where the velocity is very great—there is lost carrying capacity to the extent of the thickness of gas rendered stationary before the obstacle to its proper direction is overcome.

If Mr. Jones (in the paragraph quoted at the opening of this communication) is referring to the existing three miles of mains between Beckton and Canning Town, I can at once answer the point. When a 48-inch main is working at 48 inches initial pressure, the loss in pressure when filling into holders (say) at Bromley —3½ miles from Beckton—would be 33 inches, or (say), on an average, 10 inches a mile. Records to this effect, I know, have been made from actual working; but the conditions are special to the Gaslight and Coke Company, and would hardly be of general interest or use. Therefore, I think it is the facility that the Company's three-mile long road affords for experimental work to which Mr. Jones refers. Here could be ascertained what is the actual result to be realized by laying an independent main assimilating district conditions.

The general question of the flow of gas in pipes is of great interest and importance; but I do think, if all the existing conditions are considered, nothing can be said that is greatly unfavourable to Dr. Pole's conclusions so far as district supplies are concerned. In the technical archives of the Gaslight and Coke Company, there must be a great amount of valuable information on the subject which could be given to the gas-engineering profession through the columns of the "Journal," in which (as Mr. Chandler reminds me, in his article published in these columns on Feb. 8) Dr. Pole published his classic paper, as far back as June, 1852, on "The Motion of Fluids in Pipes," in which were set forth the laws and the principles that govern the flow of fluids through pipes.

ADOPTING A CALORIFIC VALUE STANDARD.

By G. Stanley Cooper, B.Sc.

There is a general feeling among gas engineers that the imposition of a calorific standard in connection with the coal-gas industry is imminent; and great differences of opinion are to be noted as to the rights and wrongs of its introduction. Anyway, the task of fixing the standard will be a difficult one; and it will be doubly hard on small works—especially if a standard of illumination has also to be maintained.

In his recent paper before the Midland Junior Gas Association, Mr. P. C. Balcon, of Birmingham, deplores the unreasonable outcry against the calorific value test and the double penalty. But is it unreasonable? Mr. Balcon would give one the impression that the maintenance of a fairly constant calorific value, as well as a constant illuminating power, is a matter of no moment. Unfortunately, laboratory conditions are almost unattainable in gas-works; and the maintenance of two opposing functions is beset with many difficulties. The matter of applying the test is after all a comparatively minor point. There are, admittedly, many imperfections in calorimetric methods and apparatus at the present time; but as these become a necessary part of a gas-works plant, many improvements will follow as a matter of course.

The introduction of a calorific value test is, from many points of view, a very desirable innovation indeed, when considered solely on its own merits. The chief function of coal gas at the present time is undoubtedly a heating one; and with the general adoption of the incandescent system, the necessity for maintaining high illuminating power progressively disappears. The number of Parliamentary Bills in which a reduction of the specified candle power is asked for is sure evidence that by gas companies, at any rate, it is fully recognized that the days of pure coal gas illumination are numbered. The introduction of the incandescent and high-pressure systems have made the provision of high calorific value gas the first consideration of gas engineers. For all domestic purposes, too, heat not light is required, and scarcely any evidence at all can be brought forward which really supports the case of the illuminating standard when taken in conjunction with the calorific standard. From all points of view, therefore, it would seem that the imposition of the double standard test would be a most unjust one; and, in the writer's opinion, the substitution of the calorific value test for the illuminating power standard would be the best course to take.

The question then arises as to the value of the standard to be adopted. In the Gaslight and Coke Company's Bill, the first proposal was for an illuminating power of 14 candles and a calorific value of 500 B.Th.U. Since one of the chief advantages possessed by coal gas over other heating gases is its high heating value, a high standard would seem desirable; but, on the other hand, that there are substantial arguments for a low standard is shown by the adoption of such a low value as 446 B.Th.U. by the Gaslight and Coke Company. The standard, however, compares unfavourably with that in vogue in Berlin. The gas manufactured there by the Municipality is unenriched, and is supposed to be of 12-candle power. Tested by a "Metropolitan" No. 2 burner, a light of 14 to 15 candle power has been obtained; and the gas was of a calorific value of 540 B.Th.U. A high thermal value can, therefore, be secured in conjunction with a fair illuminating standard; but, as the latter is liable to considerable fluctuations where a large amount of gas is being produced, the imposition

of a penalty for non-maintenance would entail very careful supervision and examination. The calorific value is subject only to much smaller fluctuations, and so in itself would be more easily controlled.

In the old days of flat-flame illumination, and the necessity of having a high candle power gas, engineers soon realized the possibilities of enrichment of the gas by means of benzol, &c.; and it was customary to increase the candle power of the gas produced by charging it with some good illuminating body. With the introduction, therefore, of a high calorific value—assuming it to take the place of the present standard—there is no doubt that some processes would be elaborated for the "enrichment" of the calorific power. A short consideration of the composition of coal gas, and the use of each constituent, suggests various directions from which such a process might spring. In an average sample of gas, the constituents can be divided into three classes broadly. Thus (1) Illuminants—ethylene, acetylene, benzene, &c., about 6·5 per cent. (2) Diluents—which contribute the main heating effect—hydrogen, marsh gas, and carbon monoxide, about 90 per cent. (3) Impurities—nitrogen, carbon dioxide, and sulphuretted hydrogen—about 3·5 per cent. The heating effect of coal gas is due almost entirely to the gases in the second class—and especially hydrogen and marsh gas; those in the first class contribute all the light and very little heat. If, then, the production of a heating gas is the chief object, we must aim at increasing the proportions of hydrogen and carbon monoxide at the expense of the acetylene, ethylene, &c.

The temperature of the hydrogen flame in air is one of the highest attainable by any gas flame; and therefore the addition of a small amount of this gas to the coal gas should have beneficial results as far as heat is concerned. The question then arises as to how the amounts of these gases can be increased. It is well known that high heats in carbonization result in the production of a lower candle power gas. This is due to the fact that the unsaturated hydrocarbons are partially decomposed into saturated bodies, free carbon, and hydrogen. Thus, ethylene when strongly heated breaks down, forming marsh gas, hydrogen, and carbon—

$$2C_2H_4 = 3C + CH_4 + 2H_2$$

This hydrogen may pass into the coal gas unchanged, or may unite with oxygen and pass over as steam. The combination of a water-gas process with the manufacture of coal gas is also a possibility. No doubt, with the adoption of a calorific test, some such arrangement would be resorted to; but all depends on the imposition of the test by the Government.

The double penalty will be doubly hard, as it necessitates the production in full of both the first and second groups referred to above, and, as has been shown, the functions of these groups are diametrically opposed—the quantity of one can only be increased at the expense of the other. If a standard is imposed, it ought to be a sufficiently high one—say, 500 B.Th.U.; and it is to be hoped that the Government will take all circumstances into full consideration before inflicting such a hardship on the gas industry at large as the imposition of a high double standard would be.

EXPERIENCES WITH SEMI-VERTICAL RETORTS, & NOTES ON CARBONIZING SYSTEMS AND RESULTS.

By Alfred T. Harris, of Market Harborough.

[A Paper read before the Midland Association of Gas Managers, March 3.]

In fulfilment of a promise made some time ago, I have now the pleasure of laying before you particulars of the setting of semi-vertical retorts of the angle known as Love's "Forty-fives" erected at these works, and my experiences as to their working.

An increased demand for gas rendered an extension of the carbonizing plant necessary during the summer of 1908; but having erected a new retort-stack with full-depth regenerator settings in 1900, no reconstruction was necessary—the extension being merely required to provide for the increased output, which, it may be remarked, has risen from 33 million cubic feet in 1900 to 53½ millions in 1910. During 1907, experiments extending over several months were made with heavy charges in the horizontal settings; and so satisfactory were the results, both as regards increased yield of gas, better quality of coke, and freedom from choked ascension pipes, that I decided, subject to the approval of my Committee, that the extension should be of such a system as would permit of the advantages of the full retort being obtained.

It may be stated that, owing to the difficulty of drawing the coke by hand from horizontal retorts with full charges, I have been reluctantly compelled to revert to the six-hour charges. With a view, however, of returning to the system of full charges as soon as possible, the whole of the horizontal retorts are being converted to throughs as renewals of the settings occur, which will thus permit of a mechanical appliance being used to discharge the coke. After inspecting the Guildford setting, it was decided to adopt the principle of the "forty-fives" so far as the angle was concerned. And here may I be allowed to express an appreciation of the kindness the writer and his Committee received at the hands of the late Mr. G. R. Love, who, whatever the future of the system may be, was undoubtedly the pioneer in applying the principle of full charges to inclined or semi-vertical retorts.

The setting at Market Harborough differs from the original Guildford setting in several respects; the latter being of the shallow regenerator type, and the feeding door of the producer being placed on the charging side, about 7 feet above the ground level. Having regard to the satisfactory results obtained from the horizontal settings here, it was decided to put down a full-depth regenerator of the same design as those already in use; so that, in the event of the new setting proving a failure, the work up to the ground level could be utilized for a bed of horizontals (the new bed being a continuation of the existing retort-stack), while the setting is so designed that the producer is fed direct with hot coke from the discharging side.

The setting consisted of eight retorts, each 11 feet long, ⏢ shape, tapering from 20 in. by 14 in. at the top to 22 in. by 16 in. at the bottom; the taper in the retort being adopted to facilitate the discharge of the coke. The height of the roof would not permit of longer retorts being put in; and as the erection of the bed was practically in the nature of an experiment, it was decided not to incur any expense in raising the roof until it was proved that the results would justify the expenditure. The mouthpieces, ascension pipes, hydraulic main, tar-tower, &c., are of the usual pattern; the gas being taken off at the top end of the retort.

The elevator is driven by a 5½ B.H.P. National gas-engine, and discharges the coal into an overhead bunker of 8 tons capacity, from which the movable charging hopper is fed. The shoot of the charging hopper is arranged so that each tier of retorts can be charged at will; the charging of each retort being, in the first instance, operated by one lever, the stop-plate controlling the discharge of the coal being at the point where the vertical shoot is attached to the hopper.

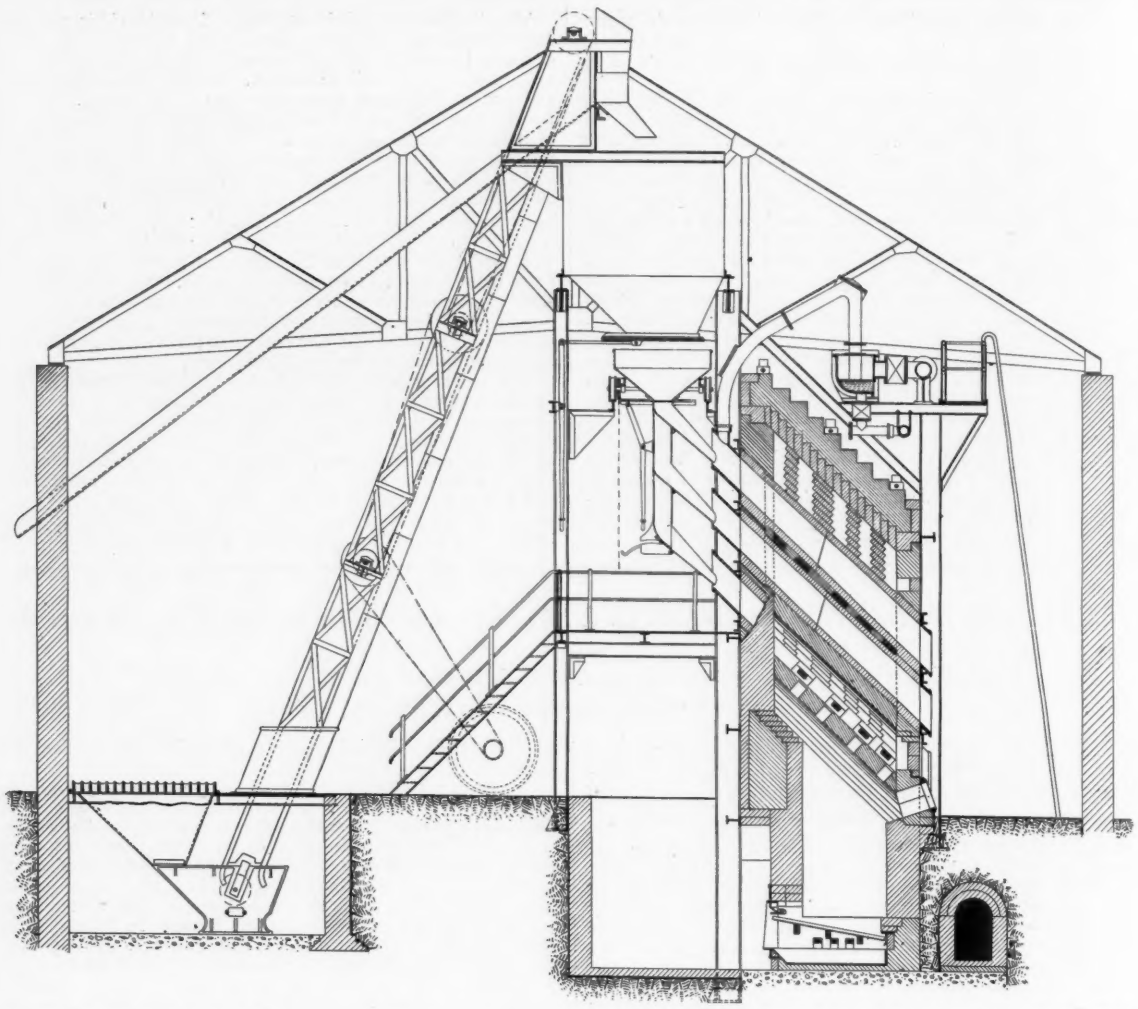
On starting the setting to work in November, 1908, troubles soon commenced to arise. In the first place, the heating of the setting was not so regular throughout as could be desired, as, if satisfactory heats were obtained in the two outside retorts in the top tier and the two bottom retorts, the heat of the retorts in the middle tier, more especially the central retort, was too intense. This, however, was not the greatest trouble, as, right from the commencement, excessive back-pressure on the bottom mouthpieces of the two bottom tiers of retorts arose. This pressure usually commenced when the charge had gone about two-thirds of the period required for carbonization, rising to its greatest until to about one-and-a-half hours before the completion of the charge being carbonized, when it gradually fell to *nil*. A pressure-gauge was fixed on one of the bottom mouthpieces, and as much as 7 inches of pressure registered.

This back-pressure resulted in the rapid formation of carbon on the retorts, more especially on those in the centre tier, which were the hottest, and from which the greatest trouble in both respects was experienced. Very little trouble arose with the top tiers of retorts; a little pressure being only occasionally experienced with coals that expanded on carbonization. This applied to certain Yorkshire and North Staffordshire coals; no trouble occurring with Derbyshire coals. But although the trouble did exist in the two lower tiers with the latter coal, it was not so great, nor extended over so long a period, as with the better class of coal.

These conditions pointed out that the trouble, apart from that relating to the heating of the retorts, arose principally from two causes: (1) The character of the coal used; and (2), the density of the coal within the retort. With regard to the latter, it will be noted that in the top tier of retorts, where the coal practically slides from the charging hopper into the retort, very little trouble was experienced; but in the lower tiers, where the coal had a drop of 3 ft. 6 in. and 6 ft. 6 in. respectively on to the branch shoot into the retort, this not only caused the coal to be broken into smaller particles, but, by the greater velocity gained, it resulted in the charge being more compressed, and of a more dense character, than that in the upper tier of retorts.

Some relief was obtained in reducing the rate of feed of coal into the retorts; but with the better class of coals, the trouble more or less remained during the period the retorts were working, which extended into the Spring of 1909, when, with a view of remedying the defects referred to, the setting was put out of action. A twenty-four hours' test of the working results was made, which showed a production of only 8000 cubic feet per mouthpiece, with a yield of 11,400 cubic feet per ton with South Yorkshire coal. Having regard to the fact that the distance between the front and back wall of the setting (inside measure) is only 5 ft. 4 in., as compared with 8 ft. 9 in. in our horizontal settings (these retorts being 10 ft. 3 in. long over all and the producer being practically of the same size as those in the horizontal beds of eight), it will be seen that, after deducting the space occupied by the transverse walls, there is not nearly so much space available for the combustion and travel of the gases as in the horizontal settings.

Being convinced that the working of the producer was right, and that more room was required in the setting for the combustion and travel of the gases, it was decided to take out the centre retort in the middle tier; thus making room for a much larger



Bench of Eight Semi-Vertical D Retorts—20 inches by 14 inches to 22 inches by 16 inches—Erected at the Market Harborough Gas-Works. Heated by Drakes Patent Tube Regenerator Furnace.

combustion chamber. A curtain arch was also built in the producer, so as to convey the furnace gases nearer to the lower end of the retorts, where the heating had not been so good as near the upper ends.

Having regard to the fairly satisfactory working of the top tier of retorts, alterations were also made in the charging shoot, by the insertion of two movable stop-plates in the vertical shoot immediately above the branch shoots which feed the middle and lower tier of retorts. Prior to charging the retorts in either of these two tiers, the coal is allowed to fall down the vertical shoot on to the stop-plate above the retort intended to be charged; and on withdrawing the plate the coal slides into the retort—the rate of feed being easily controlled by the operator. A movable iron plate is inserted in the mouthpiece during charging, which enables the coal to slide freely into the retort, clear of any tarry matter lying on the mouthpiece.

The setting was brought into use again early in October last, and has been working continuously to date. The alteration to the setting has resulted in the more even and better heating of the retorts, while the trouble from pressure on the bottom mouthpieces has entirely disappeared, provided due care is exercised in regulating the feed of coal when charging the lower part of the retorts. The rate of the formation of carbon has not been nearly so great as in the previous winter; but it is still in excess of that taking place in the horizontals, and accumulates quickest in the hottest retorts, these requiring cleaning every six or seven weeks. There has not been complete immunity from stopped ascension pipes; but these are of very rare occurrence, and only with the pipes from the top retorts. The deposit is of a very soft nature and easily removed.

The fuel consumption is similar to that in the horizontal settings. The coke produced is of a superior quality to that obtained from the horizontal settings; being larger, denser, and heavier, and practically free from breeze. The majority of the charges require a little assistance in the discharge, very few coming down completely of their own accord; but, generally, very little trouble is experienced in fetching them down.

Since the setting was started in October, it has not been possible to carry out tests over an extended period; but the result of a short test recently made shows the productive capacity to be equal to 9500 cubic feet per retort per diem, with a yield of 12,300 cubic feet of gas per ton of coal carbonized; the gas being 15·80-candle power tested with a No. 2 "Metropolitan" burner. The coal used was South Yorkshire and Derbyshire nuts.

It is impossible to give any figures relating to working costs, as, being a small unit, only a portion of the stokers' time is occupied in working the bed.

The charges in the two top tiers of retorts are of nine hours' duration, and the two bottom retorts eleven hours' duration; the weight of the coal in each charge being slightly under 7 cwt. There is no doubt, that a great saving in labour is effected by this system; but expectations in regard to producing capacity have hardly been realized, due to the long length of unworkable retort in the front and back walls; the proportion being considerably in excess of that in horizontals.

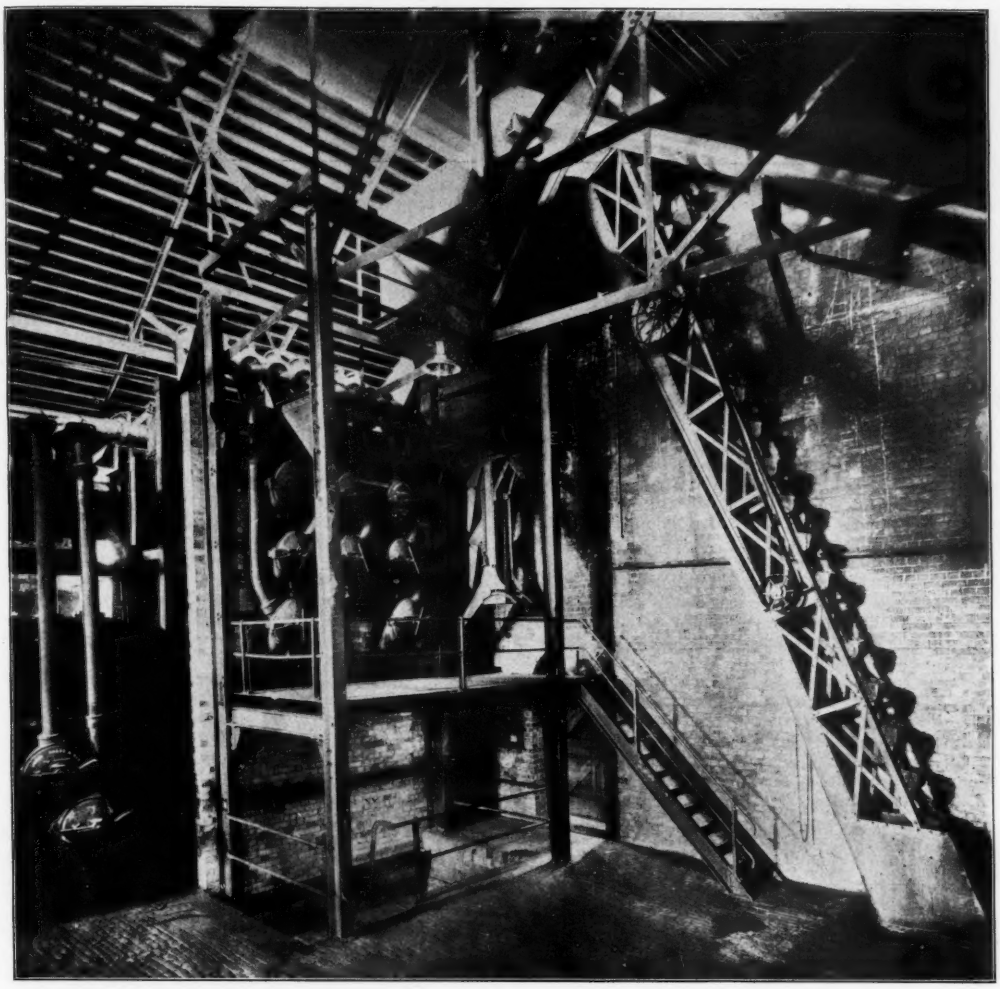
The carbonizing results from this setting, in conjunction with the horizontals, during December were as follows; the largest make in twenty-four hours being 237,000 cubic feet.

Gas made	6,670,000 cubic feet
Average make of gas per diem	215,161 " "
Number of retorts at work { 18 horizontals, 7 semi-verticals }	25
Average make of gas per retort per diem	8606 cubic feet
Number of stokers	6
Average make of gas per stoker per shift	35,860 cubic feet
Coal used	550 tons
Gas made per ton of coal	12,127 cubic feet

The coal used was 30 per cent. each Derbyshire and North Staffordshire, and 40 per cent. South Yorkshire.

The subject of carbonization has never in the history of gas manufacture received such universal attention at the hands of gas engineers as at the present time and during the past two or three years. Recent experimental and research work has resulted not only in the reintroduction of old ideas in the form of heavy charges, but has also brought into actual practice systems which hitherto could only be regarded as in the experimental stage. This refers more especially to vertical retorts, and also to the introduction of machinery, which has enabled the advantages of heavy charges to be applied, not only to existing settings of horizontal retorts, but also to permit of carbonization in bulk in chamber settings.

The methods of carbonization may now be described as continuous and intermittent; the introduction of the vertical retort having, through the ingenuity and perseverance of Messrs. Woodall and Duckham and Messrs. Glover and West, been the means by



A Corner of the Retort-House at the Market Harborough Gas-Works.

which the ideal method of continuous carbonization has become practicable. In a communication by Herr E. Körting, of Berlin, on "Modern Methods of Carbonization" (an abstract of which is given in the "JOURNAL OF GAS LIGHTING" of Jan. 11 last), it is stated that an advantage of continuous carbonization is the complete absence of smoke; but it presents the following disadvantages: (1) Separate charging and discharging mechanism is required for each retort. (2) The continuous movement of the whole contents of the retort cannot possibly be advantageous to the coke. The economy of the system would be thoroughly dubious if the reduced durability of the coke increased the quantity of coke breeze by only a small percentage of the coal carbonized. (3) It is impossible to inspect the inside of the retorts (because they are always quite full) and ascertain if they need repair and whether the coal is properly disposed in them. Whether these supposed disadvantages are not more imaginery than real can now be proved by the experience gained in the working of such systems in actual practice. I hope reference will be made to these points in any discussion that may arise.

The intermittent system of carbonization is also applied to vertical retorts, the most prominent of which is the Dessau system. Having regard to the trouble experienced by the writer in respect to the pressure in the lower part of the semi-vertical retorts, it would appear that any system of vertical retorts in which the coal is allowed to drop for a considerable distance, and so become compressed, must be subject to the same drawback, and more especially with coals that expand during carbonization. Reference to this point directs one to the interesting study of the travel or passage of the gas from retorts with full charges.

The absence of pressure in the lower part of the semi-vertical retorts during the earlier stages of carbonization points to the conclusion that during this period the passage of the gas is through the centre or core of the charge, but that during the later stages of carbonization, when this centre or core becomes fluxed, the gas is forced to make its exit through the passages offering the least resistance, which is either through the coke itself or between the coke and the walls of the retort. With coals that swells considerably during carbonization, rendering the coke very dense and compressed tightly against the sides or walls of the retorts, very great resistance to the passage of the gas occurs; and in such cases the rapid formation of carbon must inevitably result, reducing the capacity and rendering frequent cleaning of the retorts necessary.

In the continuous system with the vertical retort the same conditions do not obtain in this respect as in the intermittent. In the former, the drop of the coal is very short. Moreover, the coal is not completely carbonized until nearing the bottom of the retort; thus leaving the centre or core open over the greater length of the charge for the free passage of the gas—the fluxed condition only extending over a comparatively short distance, and this at a point where the coke does not press heavily on the sides of the retorts. In the intermittent system, the conditions being approximately the same throughout the whole length of the retort, it is only reasonable to suppose that, under certain conditions, very great resistance to the exit of the gas generated in the lower part of the retort during the later stages of carbonization must occur. The rapid formation of carbon which must occur under these conditions must necessarily have a prejudicial effect, not only on the make of gas, but also on the life and working of the retort.

The advantages claimed for vertical retorts are too well known to require repeating here, and experience of their working in this country has apparently been too short to enable any disadvantages that may actually exist to be recorded. Personally, I am of opinion that vertical settings will not adapt themselves to intermittent use so readily as horizontals or inclines, as the construction and size of the retorts do not permit of their being so easily repaired.

The writer is informed that on the Continent considerable trouble has occurred in restarting settings to work, owing to the difficulty in executing repairs which are always necessary after a setting has been put out of action, consequent upon the contraction of the material on cooling and the resultant cracking of the retorts.

Retort-house practice, even with existing plant, has made great progress during the past two or three years, consequent upon the introduction of machinery which has enabled horizontal retorts to be adapted to the latest methods of carbonization. Mr. Bell, in his paper on "Carbonization," read at the last meeting of the Institution of Gas Engineers, showed to the fullest the advantages to be gained from heavy charges in horizontal retorts; and it is pleasing to hear from Mr. Bell that the figures given in his paper are fully borne out in his balance-sheet, which is, of course, the most important factor.

A close study of the Derby figures tends to show that the results obtained from the Derby system, so far as yield of gas is concerned, approximate very closely to those obtained from vertical

TABLE *showing Yield of Gas and Illuminating Power obtained from Various Systems.*

System.	Place of Working.	Name of Coal.	Gas Made per Ton. Cubic Feet.	Illuminating Power No. 2 "Met."	Sperm Value per Ton of Coal.	Calorific Value B.Th.U.
(1) Woodall-Duckham Continuous vertical retorts	Nine Elms, London	Blackwell and Sutton (Notts.)	12,833	15·18	667	570 gross
(2) Glover-West " " "	St. Helens	Thornley, Durham	13,102	15·56	698	514 net
(3) " " " "	"	(Barrow) Yorkshire silkstone	12,435	16·19	689	522 net
(4) " " " "	"	Arley mine, Wigan	12,145	15·22	633	516 net
(5) Dessau Intermittent vertical retorts	Sunderland	Mixture, 4 varieties (Durham)	12,465	16·84	719	559·2 net
(6) Bell horizontal retorts	Derby	Screened (Yorkshire silkstone)	12,788	16·25	712	Not given
(7) " " " "	"	" (small nuts)	12,544	15·35	660	"
(8) " " " "	"	" (black)	12,607	15·00	648	"
(9) Glover chamber settings	Norwich	Not given	13,247	14·94	677	493·9 net
(10) Meunier inclined retorts	Stockport	" "	12,807	14·96	656	Not given

retorts. This is borne out by the recent statement by Mr. J. W. Helps at the Manchester meeting in regard to a yield of 13,000 cubic feet of gas per ton of coal being obtained in horizontal settings at the works of the South Metropolitan Gas Company, and which I understand are worked under similar conditions to those existing at Derby. These figures indicate that the horizontal retort is far from being played out, and will still be an important factor in the future production of coal gas, as, apart from the financial liability in respect to existing horizontal plants which prohibits their being scrapped, the introduction of the Fiddes-Aldridge, De Brouwer, and other charging and discharging machines has brought the labour costs in large works down to a point which leaves a very narrow margin of difference between this system and its latest rivals.

The gas results which appear to be obtained from the chamber settings at Norwich are very satisfactory, in addition to which the coke produced is of a much better quality than that obtained from other systems. The ease and reliability with which charges of one ton are placed in and discharged from these chamber settings also point to low labour costs by their adoption, and prove that the system of carbonization in bulk can successfully be applied to gas-works practice.

No information is as yet to hand as to any attempt being made to apply the principle of heavy charges to the ordinary inclined retort, probably due to the difficulty that would arise in fetching down the coke. The results of any tests that may have been made in this direction, even if not successful, would no doubt be interesting. Considerations other than yield of gas and labour costs must be taken into account when considering the relative merits of various systems. Yield and quality of residuals, fuel consumption, wear and tear, frequency and cost of renewals, and relative first costs are all important points to be considered, and can only be determined by experience.

It is gratifying to note that such eminent authorities as Messrs. Samuel Glover, Thomas Glover, and J. Ferguson Bell have promised to take part in the discussion and contribute further valuable information in addition to what they have previously given, and for which the gas industry as a whole is indebted to these particular gentlemen.

The above table shows the results obtained from the various systems referred to in respect to yield of both gas and illuminating power. The figures given do not enable a fair comparison of the results obtained from the various systems to be made, owing to the different character and gas-producing qualities of the coals used. Is it not possible for the Carbonizing Committee of the Institution of Gas Engineers to make arrangements for reliable working tests of the various systems to be made with the same class of coal? If this could be done, it would enable a definite comparison to be made as to the gas producing and other merits of each system. Personally, I am of opinion that the increased yield of gas which is now generally being obtained from the coal is not entirely due to the alteration in former, or the introduction of new, carbonizing methods, but is to a great extent attributable to the improved conditions now generally prevailing in regard to a free and steady passage of gas from the retorts.

The recent invention of Mr. Meunier for preventing the oscillation of the seal in the hydraulic main, and enabling a steady gauge to be maintained within the retort, has, apart from the advantages claimed in respect to the naphthalene trouble, resulted in an increased yield of 1220 cubic feet of gas per ton of coal carbonized. I understand the make of 12,807 cubic feet of 14·96-candle power gas, now being obtained with inclined settings at Stockport, are results which compare favourably with those from other systems.

The retort-house governor has undoubtedly been one of the most important and valuable adjuncts to the carbonizing plant introduced during recent years, as by its use, perfect and steady control of exhaust or pressure within the retorts is now obtainable; and not only is it possible to reduce the seal to any desired extent, but also to dispense with it altogether. One of these governors has been in use at Market Harborough during the past four years; and its adoption has resulted in an increased yield of gas to the extent of about 400 cubic feet per ton of coal —the average make of gas per ton during the above period having been 11,650 cubic feet.

During the past winter, we have dispensed with the seal altogether, except when drawing or charging; and while a large yield of gas has been obtained, no trouble has been experienced either in regard to choked ascension pipes or the control of the illuminating power.

To secure the unsealing of the dip-pipes, a displacing chamber consisting of a cast-iron rectangular box with an open top and fitted with a wood plunger is connected by a 2-inch wrought-iron pipe to the hydraulic main, through which the ammoniacal liquor forming the seal passes to and fro between the hydraulic main and the box. In order to unseal the dip-pipes, the wood plunger is raised from the box to above the seal-level; and to reseal, the plunger is lowered into the box. The raising and lowering of the wood plunger is performed from the retort-house floor by means of a wire rope running on pulleys supported from the roof principals. The plunger is arranged to admit of a displacement of a ¾-inch seal in the hydraulic main. By the above simple means, without incurring expense for anti-dip valves, existing hydraulic mains can be converted into dry mains, with the advantage of the seal being always available. Serrated dip-pipes have also been fitted to three of the horizontal beds; the oscillation of the liquor being less with these than with straight ends—this being observable by sight-glasses fitted to the hydraulic mains.

One of the advantages claimed for vertical retorts on the continuous system is that a hydraulic main is not always necessary —the gas having a free passage from the retort to the take-off pipe. Where a seal is employed and no means taken to prevent oscillation of the liquid forming the seal, the conditions prevailing in the retort itself cannot conduce to the best results being obtained.

It is unfortunate that some scheme cannot be devised whereby carbonizing returns would reflect a reliable indication of the merit of the results actually obtained. The varying qualities of coal used in different works prevent a reliable comparison being made as to the relative efficiency of working; and in many instances where such returns are in the hands of persons unacquainted with the conditions prevailing, the figures often create a wrong impression, both in regard to works showing high and low makes of gas respectively. A separate record may at least be given where the coal-gas plant is augmented by a water-gas or other auxiliary plant, as, unless each gas is measured separately, the figures can only be estimated, and a fair comparison with other works making only straight coal gas cannot be arrived at.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Second Annual Dinner.

Last Saturday evening was the date fixed for the second annual dinner of the London and Southern District Junior Gas Association; and at the hour appointed, a party of about eighty sat down at the Horse Shoe Hotel, Tottenham Court Road. In every way, the function proved a great success; the musical programme (the majority of the contributors to which were members of the Association) being most enjoyable. The chair was occupied by Mr. W. J. Liberty, the President; and he had on his right and left hand Mr. E. Pilbrow, of the Gaslight and Coke Company, and Mr. Henry Austin, of the South Metropolitan Gas Company. Additional interest attached to the event on this occasion from the fact that the meeting of the Joint Council of the Junior Gas Associations had met together earlier in the day in London; and the delegates were therefore able to be present at the dinner. These gentlemen were Mr. James Taylor (President) and Mr. J. Alsop (Secretary) of the Manchester Junior Association; Mr. S. W. Shepherd, President of the Yorkshire Junior Association; Mr. A. O. Jones (President) and Mr. H. E. Temple (Secretary) of the Midland Junior Association; and Mr. A. L. Holton, Secretary of the Joint Council.

The Loyal Toast having been duly honoured, the Chairman proposed "The London and Southern District Junior Gas Association;" remarking that in his opinion the Association never stood in higher esteem with the seniors than it did at the present time. Members found it easy to obtain leave of absence to join the visits; and all possible help was afforded them in the preparation of papers, and in the provision of apparatus for demonstrations at the meetings. Some years ago, it was hard to

find young men who would take a place at the head of the organization; and now the difficulty was to choose from the large number available. He felt sure that in a few years' time they would have many of their present members occupying positions which would qualify them for membership in another Society. He coupled with the toast the name of Mr. D. W. Winslow, one of the oldest Vice-Presidents. Mr. Winslow said he presumed he was called upon to respond in the absence of Mr. W. Upton, who he knew had the interests of the members much at heart, and had helped greatly to put the Association on the splendid footing it occupied now.

"Our Visitors," coupled with the names of the delegates of the English Junior Gas Associations and Mr. Pilbrow, was submitted by Mr. L. F. Tooth, the Senior Vice-President, who offered them a hearty welcome and the sincere thanks of the Association for the compliment conveyed by their presence. The delegates had, he remarked, attended a conference that afternoon, much to the benefit of all concerned; and Mr. Pilbrow had been most hospitable in providing them with accommodation for the meeting, and with tea. In response, Mr. Taylor said he was pleased to have an opportunity of acknowledging the kindness that he, along with the other delegates, had received that day. The treatment they had experienced was such that he would have very gratifying reports to give to his friends in Lancashire. As the representative of the oldest of the Junior Gas Associations, he was delighted to be present. He felt that a meeting of the representatives of 700 members of English Junior Gas Associations could not but be productive of a vast amount of good—if for nothing else than the mere fact of the friendship that was thereby engendered. The only matter for regret was that the Scottish Junior Associations, except on one occasion, had been unable to be present at these conferences. But this must in fairness be put down to the distance away at which they lived. Mr. Jones expressed his pleasure at visiting the London Association, and at the generous treatment meted out to the delegates. He thought that at the conference they had pretty well agreed that next year should see a united visit of the Associations to Birmingham; and if this came about, he could assure them all that they would have a thoroughly hearty welcome. Mr. Shepherd also acknowledged the hospitality shown to the delegates. Mr. Holton recalled the fact that the first joint meeting was held in Manchester. The second was at the Franco-British Exhibition in London; and had the reception then not been of a cordial character, he imagined that little would have been heard of future joint meetings. But because it had been of such a cordial nature, the Junior Associations were now joined together permanently for good and useful work. Mr. Pilbrow said he hardly felt he was a visitor, as he was one of the patrons of the Association. He had been pleased to do what he could to make the meeting of the Joint Council a success; and it would always be a pleasure to render any assistance in his power to the Junior Associations. He hoped to meet many of the members of the various Associations throughout the country at the Japanese Exhibition this year.

Mr. P. Smithers proposed "The Chairman." Those who had come in contact with Mr. Liberty, he remarked, could not fail to recognize his earnestness of purpose. His whole heart and soul had been put into the work of the Association. In reply, Mr. Liberty said there was certainly a great amount of work to do in connection with the position of President; but if one's heart was in the task, it became easy. They would be glad to know that there were about eighty present at the dinner this year, as compared with forty last year. Also that the Association had been strengthened by the accession of many members residing outside the London district. As President, he was able to go to the meetings of different Societies and shake hands with many men the members knew and revered; and he always had a hearty welcome. At such meetings, he was always asked, "How strong is the Junior Association now?" and "Are you really doing good work?" It would, however, have been impossible for him to have held the office for two years, had he not been ably backed up by the Council and the members. Mr. Tooth as Senior Vice-President, and Mr. T. F. Canning as Junior, had given him much help; and then there were Mr. S. A. Carpenter, the hard-working Secretary, and Mr. J. Hewitt, the Treasurer.

The assistance rendered by the Technical Press to the Junior Associations was gracefully acknowledged by Mr. H. Rothwell, Mr. Temple, and Mr. Alsop; and before separating, the Stewards (Messrs. Rothwell, Smithers, and Tooth) were, on the proposition of Mr. Carpenter, seconded by Mr. Canning, heartily thanked for the large share which they had taken in making the evening so great a success.

The absorption of the Hailsham Gas Company by the Eastbourne Gas Company under their Act of last year, the extension of the mains to Polegate and Hailsham, and the increased business arising from the natural growth of the Company's undertaking in Eastbourne and the district, have necessitated the raising of more capital; and it will be seen, from an announcement which appears elsewhere, that the Directors are inviting tenders for an issue of £10,000 (inclusive of premiums) of "B" stock, the present dividend on which is 6¼ per cent. The present issue of stock commends itself to small investors, inasmuch as, under the Company's last Act, £5, or multiplies thereof, may be applied for. The Company work on a low capital, there are no debentures or mortgages, and there is a reserve and special purposes fund of £6108.

THE ELLIOTT GAS-ANALYSIS APPARATUS AND STANDARD PHOTOMETRIC LAMP.

By E. C. Uhlig,

Chemist at the Citizens' Gas-Works, Brooklyn, New York.

[Papers read before the New York Section of the Society of Chemical Industry.*]

THE ELLIOTT GAS ANALYSIS APPARATUS.

Comparative results obtained with the Elliott and Hempel gas-analysis apparatus in my laboratory gave the following results: A volume of gas (3 cubic feet) was taken into a 5 cubic feet gas-holder, the water in which had been standing there for about two years—evaporation being replaced from time to time, so that the water was as saturated with gas as was possible. Samples of the gas were taken from this holder for both apparatus and analyzed, with the following percentage results:—

	Elliott.		Hempel.
Carbon dioxide	3·6	..	3·7
Illuminants	13·6	..	13·4
Oxygen	0·6	..	0·6
Carbon monoxide	27·0	..	26·5
Hydrogen	29·3	..	29·3
Methane	19·5	..	18·6
Nitrogen	6·4	..	7·9

The above methane and nitrogen results were calculated from the explosion, using the regular contraction factors. Calculating the same from the residual nitrogen left after explosion and absorption of carbon dioxide and oxygen with sodium pyrogallol, the following figures (percentages) were obtained:—

	Elliott.		Hempel.
Methane	19·6	..	17·5
Nitrogen	6·3	..	9·1

From the residual gas of the Hempel sample, 20·2 c.c. of the gas were taken and mixed with 47·9 c.c. of air and burned in a palladium tube, with the following results calculated on the residual gas: Hydrogen, 30·3; carbon monoxide unabsorbed by cuprous chloride, 1·1.

The absorptions in the Elliott apparatus were done in the usual manner by allowing the reagents to spread over the inside surface of the absorption tube; and in the Hempel apparatus by allowing the gas to remain in contact with the reagent while shaking the pipette till two successive readings agreeing within 0·1 c.c. were obtained. Carbon dioxide was absorbed in sodium hydroxide in both apparatus. Illuminants were absorbed with bromine in the Elliott apparatus, and with fuming sulphuric acid in the Hempel apparatus. It was found that this reagent was more effective than bromine in the latter apparatus, and that bromine in the former was as effective as fuming sulphuric acid in the Hempel apparatus. Bromine in a Hempel pipette is in an aqueous solution; and, on shaking, weak bromine vapours are given off, which do not act very strongly on the illuminants. This makes the absorption slow; and repeated absorptions are necessary. Fuming sulphuric acid acts rapidly, and one or at most two absorptions are all that are needed. Bromine in the Elliott apparatus is applied as liquid element and not in the aqueous solution. Strong vapours are given off which act at once—in fact, the reaction may be watched, and the bromides formed can be seen running down the tube. Oxygen was absorbed in the Elliott apparatus with alkaline pyrogallol, and in the Hempel apparatus with phosphorus. The results agree very well. Carbon monoxide was absorbed in both appliances with acid cuprous chloride. The results show that the absorption is perhaps slightly more complete in the Elliott apparatus. Two pipettes were used in the Hempel apparatus. Constant readings were first obtained in one pipette; and on trying the second pipette a further absorption of 1·5 c.c. was obtained. Cuprous chloride is slow in its action; and any unabsorbed carbon monoxide will affect the subsequent explosion.

The explosion was done over water in the Elliott apparatus and over mercury in the Hempel. All comparative analyses made with different apparatus appear to agree as far as the explosion; but at this point variations are noticed. These differences have been ascribed to several causes; principal stress being laid on the solubility of the carbon dioxide in water. It is my opinion that while this may be one of the causes, it is not the main cause. It will be noticed in the preceding analyses that explosion over mercury gives even more divergent results than explosion over water. I think the reasons for these differences are principally unabsorbed carbon monoxide in the residual gas, and too much air mixed with the part taken for explosion. In regard to the latter, I find that the best results are obtained by taking just sufficient air to leave about 0·5 to 0·7 c.c. of oxygen after the explosion. This lessens the possibility of the nitrogen of the gas being oxidized in the explosion. The amount of air to be taken is variable, and can only be found by experimenting with a portion of the residual gas. Illuminating gas may also contain ethane; and as this forms two volumes of carbon dioxide in the explosion, it will cause some difference in calculating the methane.

Almost any apparatus will give good technical results in the hands of a careful operator; but in gas-works practice preference must be given to apparatus which will produce the results in the

* Reprinted from the Society's "Journal."

shortest time. With the Elliott apparatus, an analysis can be finished in from 30 to 40 minutes—in cases of great hurry in possibly 25 minutes; but the best results are probably obtained in about 45 minutes.

THE ELLIOTT STANDARD PHOTOMETRIC LAMP.

This lamp is designed as a secondary standard for the determination of candle power by the men on the works; and it is intended for the guidance of the gas-maker in place of the unreliable jet photometer. It is of the well-known "student-lamp" type of about 16-candle power, the light being reduced by means of a screen to 10-candle, and in the latest models to 5-candle power. The fuel burned is "Astral" oil. It is furnished with a reservoir which will hold sufficient oil to burn for 12 hours; but the lamps have been made with 24-hour reservoirs. The lamp is standardized against candles or against a standardized sample of gas which may be taken from a 5 cubic foot gasholder. When once standardized, the lamp will maintain its candle power for 12 hours or even longer. The 5-candle standard permits of more accurate adjustment in this respect. It requires reasonable care in its use. The wick must be properly trimmed according to the directions given with the lamp, the oil must be clean, and the burner kept clean, particularly in the air-holes. Observing all these precautions, a careful operator will get results which agree very closely with those obtained with other standards.

The method of using the lamp is as follows: After cleaning, filling, and trimming, it is placed in position at the end of the photometer bar, at the other end of which the candles or standardized gas is burning. The lamp is lighted and allowed to burn for about 15 minutes. Readings are afterwards taken, and the usual corrections applied. The gas to be tested is then put in the place of the candles or standard gas, and readings taken with the value of the lamp as the standard. These readings may be taken as often as required during the day.

It has been found that this lamp varies very little each day from the value found on the first standardization. Generally the 10-candle lamp will not vary more than 0·1 candle from day to day, while the variation of the 5-candle lamp is even less. Any variation will be due mostly to a change in the quality of the oil used. It is good practice to reserve a quantity of oil for use in the lamp only, and not take oil from a receptacle in general use. Of course, variations will occur, due to wear, particularly in the burner; but this can be corrected by occasional repair.

A test of this lamp was made by taking the candle power of gas delivered to two photometers, on one of which (60-inch) the lamp was used as a standard, on the other (100-inch) the standard was sperm candles. The lamp was 10-candle standard, and tests were made hourly on each photometer for 13 hours. The average results were as follows: Illuminating power of the gas by lamp, 24·30 candles; of gas by standard candles, 24 candles.

The following results with a 5-candle Elliott lamp against a Hefner amyl-acetate lamp adjusted to 1 standard candle are communicated:

	Candle-Power.		Candle-Power.
Elliott lamp . .	= 5·02	After 7 hours . .	= 5·00
After 2 hours . .	= 5·01	,, 8 ,, . .	= 5·00
,, 3 ,, . .	= 5·01	,, 9 ,, . .	= 5·00
,, 4 ,, . .	= 5·01	,, 10 ,, . .	= 5·00
,, 5 ,, . .	= 5·00	,, 11 ,, . .	= 5·00
,, 6 ,, . .	= 5·00	,, 12 ,, . .	= 5·00

ANALYSIS OF ILLUMINATING GAS.

By Dr. Arthur H. Elliott,

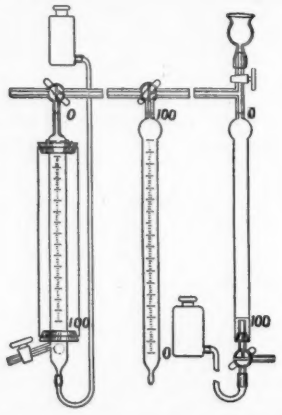
Engineer-Chemist of the Consolidated Gas Company, New York.

[A Paper read before the New York Section of the Society of Chemical Industry.*]

The gas analysis apparatus which I use in my laboratory consists of three tubes, one of which is water jacketed. These are connected to one another and with aspirator bottles by means of rubber tubing. There are three aspirator bottles, and each is filled with water of the temperature of the room. The gas is introduced by means of rubber tubing, also filled completely with water, attached after removing the funnel above, and connecting with the source of supply. The apparatus must be used with water at a constant temperature. For this purpose, we have in our laboratory a tank that is kept at the uniform temperature of the room, and fills automatically from time to time. The temperature remains very constant.

The first operation is to fill the glass collection-tubes (which hold 200 c.c.) with water from the tank, and then, upon opening the stopcocks, the outflow of the water allows the gas to flow in. By reversing the operation, connecting by a water-filled rubber tubing, the gas can be forced into the gas-analysis apparatus. Having drawn the gas into the first tube (which is marked below, indicating 100 c.c.), more gas is taken in than is required. It is introduced by the aspirator bottles into the second or middle graduated tube and measured accurately—arranging the bottles so that the water in the lower one is level with that in the tube. After the upper stopcock is closed, the excess in the first tube is rejected through the funnel. The chemicals are introduced by means of the funnel, which fits on the outside of the end of the stopcock on the first tube, called the laboratory tube. Transferring the gas (100 c.c.) from the middle tube, where it has been measured, back into the laboratory tube, which is full of water, the water is driven over from the middle tube until it occupies a position marked on the capillary part of the laboratory tube above. Owing to the peculiar shape of the bulb of the laboratory tube, the gas is pulled down at the sides by the solutions used, and returns up the middle of the tubes, thus circulating.

A very little (a few drops) of the chemical makes an enormous surface and gives the gas a chance to be absorbed. The first fluid put in is sodium hydroxide solution (1 in 5) to absorb carbon dioxide. A little water is then added to wash out the capillary tube of the funnel, and a little is also forced from the middle tube. The upper surface of the fluid in the laboratory tube is then nearly clear water. The gas is driven into the middle measuring tube by means of the aspirator bottles; the fluids being stopped at the zero point above. We do not measure the gas at once, but wait for the tube to drain. In order to allow the water to settle uniformly, the lower and upper stopcocks on the laboratory tube are opened, the sodium hydroxide and carbonate solution allowed to drain out, and the tube washed with clean water. The water is now passed up into the laboratory tube from its aspirator bottle below, and through the top of the tube at the funnel point to expel the air. The loss of volume in the middle measuring tube gives the carbon dioxide in the gas. The next step is the introduction of the gas into the laboratory tube, again by means of the aspirator bottles, and the bringing up of the water from the central tube into the capillary tube above the laboratory tube.



Two or three drops of liquid bromine are now introduced, using a little clean water in the funnel. Too much bromine must be avoided, or the gas will expand so much from the bromine vapours that it will pass through the rubber tubing into the aspirator bottle, and be lost. As the bromine enters, it is volatilized; and the bromo-benzene and other bromo-hydrocarbons condense on the sides of the laboratory tube. After this some sodium hydroxide is run into the funnel and thence to the tube, to absorb the bromine vapours. As soon as these are absorbed, the stopcocks are washed with water. After the transfer of the gas to the middle tube as before, the contents of the laboratory tube are washed into the waste below. The difference between the last and the former reading on the measuring tube is called "illuminants."

The same series of operations is repeated in regard to allowing the water to settle a definite time in the measuring tube, as was mentioned above, to ensure a correct reading. Pyrogallol solution in water (1 in 10) and the sodium hydroxide solution (used as above) mixed together in equal volumes are used to absorb oxygen, and the cuprous chloride (solution in hydrochloric acid) is used to take out the carbon monoxide. This cuprous chloride is troublesome in the transfer of the gas between the tubes. Between the absorption and transference of the monoxide, water is added to the laboratory tube to wash out the chemical and to absorb the hydrochloric acid vapours. This water will make the fluid milky; but there will be a little clear water on the top, which alone must be transferred.

The residue of the gas which is in the measuring tube consists of hydrogen, nitrogen, methane, and possibly some other hydrocarbons, the nature of which is not well known. Formerly the explosion apparatus was used with oxygen; but uniform results could not be obtained, and sometimes the nitrogen was exploded. In the first explosion, the excess of oxygen is kept within 1 per cent.; anything much higher will give erratic figures for the nitrogen. The gas in the measuring tube is drawn into the jacketed explosion tube by its aspirator bottle. For the test, 12 or 13 c.c. are sufficient; six or seven times its volume of air is added from a quantity drawn into the laboratory tube for this purpose. Rejecting excess of air from the laboratory tube, this is used with the explosion tube and the two aspirator bottles to transfer the gas and air mixture several times between the explosion and the laboratory tubes so as to thoroughly mingle the gases. After the final transfer to the explosion tube, several minutes are allowed to elapse before making a reading, to let the water drain down to the proper level.

The mixture is exploded by a spark from an induction coil, and

* Reprinted from the Society's "Journal."

the contraction "C" read after several minutes. Transferring the gas to the laboratory tube, the carbon dioxide is removed from the mixture by means of the sodium hydroxide solution, and the gas is returned to the central tube for measurement with the usual precaution of waiting. This loss we call "D." The pyrogallol mixture first used for oxygen in the original gas is then added, and the excess of oxygen is determined. If there is not an excess of oxygen, the exploded mixture will contain carbon monoxide, and the explosion must be repeated, using another portion of the gas residuum from the middle measuring tube, adding more air to make the explosion mixture. It is rarely that more than two explosions are necessary; but about 0·5 to 1 per cent. of oxygen must be in excess to get the best results. After absorbing the oxygen and measuring the remainder (the nitrogen), the nitrogen contained in the air used for the explosion is subtracted from the residual nitrogen; the balance being the nitrogen in the portion of the residuum of gas which was used for the explosion, and is calculated to the original gas residuum. The figures which we call "C" and "D" are used in calculation, by the following formula: $\frac{2\text{ "C"}-4\text{ "D"}}{3}$ = hydrogen. The difference between the sum of the constituents determined and 100 is called methane. It will be found that the figure "D" will also equal methane if the work is properly done; and it serves as a check on results.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Monthly Meeting of the Western District Division of the Scottish Junior Gas Association was held in Glasgow on Saturday evening—Mr. D. Currie, of Stirling, the President, in the chair. There was a good attendance.

Mr. J. M. Smith (Dumfries) read the following paper:—

THE MANUFACTURE OF SULPHATE OF AMMONIA.

In the course of it, the author said that the manufacture of sulphate of ammonia now played such an important part in modern gas-works that a description of plant and production, together with an exchange of views on the various systems, was not only beneficial but incumbent for an Association like theirs. He had therefore taken as an example for his paper the sulphate of ammonia plant at the Dumfries Gas-Works. The building and plant were erected in 1908. Previous to the plant being installed, all the ammoniacal liquor was sold to a local chemical works, and carted away daily in tank-carts. This method was at times very inconvenient, especially in winter, owing to the congested state of the yard in the older part of the works. It was got rid of by the Commissioners deciding to start a recovery-plant of their own.

The liquor or products of condensation were collected from the condensers in an underground tank along with the tar. The tar was pumped into an overhead tank for loading into tank-waggons; and then the suction-pipe (which was on a swivel-joint) was lifted, and the liquor was pumped into an overhead tank, from which it gravitated to the scrubbers. Then it went through a Livesey washer, working it up to about 5° Twaddel. This overflowed into another underground well, capable of holding about 25 tons, where a similar arrangement of suction-pipe was adopted for getting rid of the tar. The strong liquor was then pumped into an elevated tank capable of holding about 36 tons; allowed to settle; and any tar that might have been carried forward was run off by means of a bib-cock into a funnel and conveyed to the underground tar-well. The liquor from this elevated tank was pumped into another elevated tank of similar capacity, fitted also with a tar take-off. The tar was run off from the tanks after every pumping, to ensure none getting forward to the still. The storage tanks, when full, would hold about 100 tons of liquor.

The plant was erected by the Chemical Engineering Company, and the saturator and leadwork by Messrs. J. Taylor and Co., of Bolton. It had a capacity of about 2 tons of sulphate per 24 hours. The still was cylindrical, and of the continuous type, 3 feet diameter and 11 feet high, of fourteen sections; the upper section being 18 inches deep, serving instead of a catch-box on the ammonia pipe to the saturator. Though a catch-box was preferable, little or no trouble had been met with in their present arrangement—only syphoning over, and that was when the man in charge was not thoroughly conversant with the plant. The upper tiers formed the free ammonia still, and the lower the fixed ammonia still; milk of lime being admitted at the centre tier, and flowing along with the liquor from the upper still, overflowing through each section, until it reached the waste liquor outlet in the bottom. Each section, except the top and bottom, was fitted with inverted serrated edged hoods and liquor overflows. The main steam supply pipe, 1½ inches in diameter, entered at the bottom section, and, blowing through the serrated edged hoods, gave the liquor a proper boiling as it made its way to the top of the still. An auxiliary liming chamber, 4 ft. by 2 ft., was placed alongside the still, into which were steam agitators for keeping the milk of lime properly mixed up. This lime was slaked by the waste liquor from the still in a large rectangular tank, and brought to boiling-point by means of steam-jets. It was then pumped into the auxiliary liming still by means of a Wilton automatic pump, working at the speed of about one stroke per minute.

This was a very good means of getting a constant stream of lime into the still, which was preferable to an intermittent supply, wherever the plant was large enough to permit it. Slaking the shell lime by means of waste liquor instead of water was an advantage, as it took a less amount of steam, and it would detect at once any fixed ammonia escaping; and great care should be taken to stop these leaks of ammonia. While the workman's sense of smell had to be depended upon to a certain extent, frequent tests of the waste liquor should be made; and if found to contain more than 0·02 per cent. of ammonia, the reason should be looked for at once. Forcing the liquor through the still was to be avoided, as by rushing matters they were only increasing the leakage, which it would more than recompense them to decrease. To the leaks of ammonia it was wise to give very careful attention, both in the storage tanks and fittings. Pipes should be examined as frequently as possible; and underground pipes, when being laid, should be arranged so that access to joints could be had without much trouble. Their pipes, where passing under the floors of buildings, were all laid in troughs built of old bricks, with a chequered plate on the top. Overhead storage tanks were both air-tight and fitted with a stand-pipe and 2-inch check-valves, set so as to allow of air being drawn into the tank when using the liquor, and also to allow it to escape while filling. The delivery-pipes into the tanks were sealed in the liquor, to cause as little disturbance of the liquor as possible, and so reduce the evaporation. The waste liquor from the still was regulated by an automatic float-valve, and was very satisfactory, allowing little or no steam to escape—which could not be said for an ordinary cock on the waste-liquor pipe, which required constant attention.

The still was also fitted with a pressure-relief pipe, which was essential on every still, in some form or other. The one supplied by the Chemical Engineering Company was very simple and efficient, consisting of a small cast-iron box connected to the bottom of the still. On the top of this box was fixed a length of 1-inch tubing to three-quarters the height of the still. A second length of 1-inch tubing was also fixed alongside the former pipe, but only half its height; the other half consisting of a glass tube—the height of the liquor in the glass varying with the pressure of the still. The effect of any alteration in the flow of either liquor or steam could be instantly noted.

On selecting any type of still, particular note should be made of access for cleaning. Hand-holes should be placed wherever possible, to allow of cleaning without taking all the still to pieces. It would be found that most of the sediment was in the bottom sections; the upper part of the still very seldom getting stopped up. Little or no trouble had been found with their type of still; easy access being obtained to all sections, and cleaning-doors placed to allow of the serrated hoods being withdrawn, and also to get at the overflows.

It was an advantage to have the still washed out periodically, though this did not lift any hard incrustation. If done frequently, however, it kept it from gathering to any extent. Their still was treated in this way, just after letting the plant down. After working about fifteen days, and on examining the bottom sections lately, by withdrawing the hoods, practically no incrustation on any of the serrated edges had taken place. The still was last cleaned out in June. On replacing the serrated hoods, care should be taken that the fixing was properly done; otherwise the efficiency of the still might be considerably decreased, and it might even stop working.

The saturator was of the hand-fishing type; the ammonia vapours passing from the top of the still over to the saturator, and being carried round each side by means of lead pipes perforated with holes, and sealed with sulphuric acid. The saturator was made up to a strength of about 62° Twaddel with acid, other liquor and water added, and then allowed to boil down to 57° Twaddel, when the salt was fished out and placed on the draining table—sufficient acid being added to keep up the strength during the fishing. This system was preferable to keeping the saturator liquor always at the salting point—especially in small plants, where one man had to attend to everything. The saturator was fitted with a perforated steam-pipe inside the apron. This was very convenient for blowing the salt forward when the saturator was salting heavily. By judicious application of the steam, a good, white salt could be obtained from the commonest acid; it being possible to boil all the dirt to the top, where it could be skimmed off. It was also very valuable in keeping the saturator sides in good condition and the holes in the ammonia pipe clear, and preventing the still gases from escaping at only one portion of the pipe, which might be the cause of blue salt being formed.

The saturator liquor was emptied into the mother-liquor well every time the ammoniacal liquor was all worked up, and filled with clean water—receiving a thorough boiling. For this purpose, he would advise as large a mother-liquor well as possible; the capacity of theirs being almost twice that of the saturator. The saturator base was covered with lead for a distance of 3 feet all round, and sloped so as to drain into the mother-liquor well. This saved the floor and kept acid from getting into the saturator foundations, should at any time the liquor boil over through back-pressure or temporary stoppage in the plant. The waste gases from the saturator passed through a catch-box into the superheater; provision being made for testing, which should be done frequently, to see that the saturator was not alkalined. These test-holes should be at a convenient position, so that the man in charge might be inconvenienced as little as possible by the gases, which were very poisonous indeed. The catch-box on the waste-gas

outlet was washed out regularly with water, to remove salt which might have been carried forward when the saturator was boiling vigorously. If this hard salt were allowed to remain, it stopped the effectiveness of the catch-box; and if acid vapour were carried forward to the condensers, trouble would arise through leaking joints—which was to be avoided.

The waste gases, on leaving the superheater, passed into the condensers. These were old oil-gas condensers that were in the works, and were more than sufficient for their requirements. The products of condensation—"devil liquor," as it is called—were passed back through the still; this being about the best way, in small plants, of getting rid of this obnoxious liquor, and obtaining the benefit of any ammonia that it might contain through irregular working. The purifier was built of brick, 18 feet square, with the gas-inlet in the centre, and a layer of oxide 12 inches thick resting on wood grids. This was protected from the weather by a roof on four columns. He liked this better than the ordinary heap purifier, as with an occasional turnover the oxide lasted for a considerable time. Owing to the acid contained in the oxide, it was bad to revivify. At first, they tried watering it with ammoniacal liquor; but this, besides being a waste of liquor, was unsatisfactory, as the oxide was usually wet enough, being exposed to the weather. The oxide was now mixed with lime—almost one-half; and it was not long in revivifying after being turned out.

The waste liquor from the still was run into settling and cooling tanks, and then into the main sewer. It was a source of trouble to gas managers to get rid of this liquor; and various methods of dealing with it with considerable success had from time to time been published in the Technical Press. In small works, any special treatment before them at present could not be said to be remunerative as regarded the recovered products; but some places had been compelled to purify their waste liquor, according to the Rivers Pollution Act.

Pyrites acid was used, of a strength of 144° Twaddel. This was delivered in tank-waggons in the works and syphoned out into an underground steel boiler of about 30 tons capacity. In places where acid was stored in underground steel tanks, these should be accessible all round, so that any leak could be detected. Acid getting into the foundations of a building would have very serious results. The acid was syphoned from the boiler into a pot made of a piece of 18-inch cast-iron pipe, sitting upright alongside the boiler, and lined with lead. The syphon connecting the two consisted of a piece of 2-inch lead pipe, with shoes on each end to keep it always sealed, even though the tank might be run empty. An elevator was fixed over the seal-pot, for lifting the acid into a storage tank inside the sulphate-house. This seal-pot was adopted so that it would not be necessary to fix the elevator over the boiler, as any hot acid from leaking flanges dropping on the boiler would soon eat it away. The storage tank inside the house was capable of holding 7 tons of acid, and was built of 3-inch pitch-pine battens, bolted together and lined with lead. There was no hole in this acid tank; the acid being syphoned over into a lead pot the same depth as the tank. From there it gravitated to the tundish of the saturator. This syphon was similar to the one previously mentioned, and was suspended by a chain and pulley fixed to the roof, so that it could be withdrawn should the bib-cock at the tundish ever require repair.

The following was the cost of production for the year ending May 15, 1909, though he might remark, in passing, that the expenses varied greatly with local circumstances—almost every gas-works producing different results.

	Per Ton of Salt. £ s. d.
Acid and oil, 17 cwt.	1 9 9
Lime, 1·70 cwt.	1 2·45
Wages, manufacture, including bagging	14 1
Cartage	7
Steam and water	3 0
Liquor, 11 tons 16·3 cwt., 2·1 per cent. ammonia	4 17 6
Interest on loan, at 3¾ per cent.	11 4·87
Depreciation.	13 0
Licence	5·50
	£8 10 11·82

The sulphate produced per ton of coal was 25·5 lbs. The average price of sulphate for the year 1908-09 was £10 12s. 1·58d.

Discussion.

Mr. A. KELLOCK (Alloa) said he had been much impressed by the simplicity of the plant described in the paper. In the works at Alloa, when they started the plant in the morning, they always turned on the steam for an hour or two, and they had the plant thoroughly heated-up before the sulphate maker came on duty. Great care should be exercised in the matter of the size of the saturator box. With a large box they had always a difficulty in getting a boil-up at the commencement; and with a small box they had a consequent loss, by ammonia gases escaping, and they did not get the same amount of heat as they would otherwise do for heating-up the still. He considered it desirable to have the heater at a temperature of 190° Fahr. at the outset, because if it were properly heated, it lessened the work of the still afterwards. In regard to the still, it was most satisfactory to see that it had a regular and constant supply of steam, and that the steam should be at a constant pressure, because thereby they ensured a steady boil in the saturator box. Like Mr. Smith, he always advocated constant testing at the various points, so that they might be able to check whether or not the men were doing their work as they should do. Mr. Smith mixed lime with the oxide—about half lime and half oxide. He (Mr. Kellock) thought this was a good idea, because it helped the oxide wonderfully. They found that the oxide could be very satisfactorily dealt with when it was put into the purifier with the lime; whereas before, when they were working without the lime, very often when the oxide was turned out it was quite useless. With regard to the question of the licence for sulphate plant, it did not matter whether the works were large or small, the licence was three guineas. This was a hardship upon small works. He thought there ought to be a graduated scale in this matter. The yield of sulphate which Mr. Smith obtained was, in his opinion, very satisfactory. It compared favourably with what they were getting.

Mr. T. W. SAVILLE (Thornliebank) asked if it would not be more profitable to work the liquor at (say) from 4° to 4½° in place of 5° strength. He also pointed out that Mr. Smith did not seem to lay much stress on the matter of the superheating of the liquor. It appeared to him (Mr. Saville) to be rather a crude manner of removing the liquor from the still. Had Mr. Smith ever tried some arrangement for taking the liquor from the top, or having two distinct stills, one set to fall into the other? The yield of sulphate was not up to the 28 lbs. or 30 lbs. some got; and the price of £10 5s. 6d. appeared to him rather low for last year.

Mr. J. FRASER (Provan) said the plant seemed to him to be very simple. He had been greatly interested at Mr. Smith's description of the valves for cleaning the still. This was an absolute necessity. As to the pump arrangement, it was a wonder to him that so simple a thing had been so long overlooked. He had been led to understand that intermittent liming in the still was very defective; but Mr. Smith had proved that the process could go on continuously by his method. The check valve being in the same relation as that of the suction and discharge of the pump, proved the simplicity of the whole thing. With regard to allowing the liquor to go away, he should fancy that, instead of its doing so with a great burst, it would simply dribble away, unless pressure of steam underneath lifted the float, in which case it would hold the thing in suspension. He should like to ask Mr. Smith how he got the syphon to retain the liquid when the tank was empty. Was the steam-tank under pressure, or what? It seemed to him that the liquid would syphon-out.

Mr. A. WILSON (Glasgow) said, as the members knew, in Glasgow they did not work up the bye-products themselves; they let them out by contract. Though they had the works, they had little to do with the treatment of the ammoniacal liquor and tar, as all this was carried on for them. The system saved them a great deal of trouble; and he thought they obtained as good financial results as managers who themselves had the trouble of operating the plant. He had thoroughly enjoyed the description of the plant, which he thought was quite suitable for small works; and the lucid way Mr. Smith had described all the details would, he was sure, be beneficial to the members.

The PRESIDENT, in closing the discussion, said they had at Stirling a similar plant and arrangement to that described by Mr. Smith; and he could heartily endorse all that had been said about the easy way in which it worked. He was much interested in the description of the storage-tanks—as to having them air-tight, and having the necessary valves for promoting the flow of the liquor into and out of them. He ventured to say there were not many gas-works in which they gave such minute attention to the prevention of the evaporation of ammonia as to have the tanks air-tight; but, at the same time, he considered it was the proper thing to do. Mr. Smith also referred to having the pipes sealed in liquor, to prevent agitation when filling the tank. This also was in the right direction, as a lot of ammonia was lost every day in gas-works through evaporation caused by having open tanks and by agitating the liquor. As to the waste-liquor float, he understood that both it and the liming-pump were patented, and that they were only fitted into the Chemical Engineering Company's stills. He considered this float-valve was one of the greatest improvements that they had in connection with sulphate plant. The old method, which he believed was usually practised, was to have a deep seal-pot, just like an ordinary one in either a scrubber or condenser, and, of course, it had to be about 6 or 7 feet deep, and underground. These were continually choking up with lime, and were difficult to clean. This arrangement of a float-valve worked automatically. Perhaps once every two or three years a new float was required to be put in. Formerly the float was made with a sort of joint in the centre; but now they were able to make it lap-welded by the oxygen and acetylene flame process. Mr. Smith stated that in the sulphate plant in Dumfries there was quite enough provision for cleaning purposes. He (the President) begged to differ from him. This was a point which he thought makers were ignoring altogether. In the plant they had at Stirling, the cleaning-holes were simply made large enough to get at the serrated hood. In fact, if there should be any sediment in the hood, there was great difficulty in getting it out. They could imagine the provision that was made for cleaning—or the want of it—in a hole (say) 6 inches broad with a rectangular nozzle. When the plant was new, it was all right, and worked for a long time; but eventually the incrustation grew to such an extent that it became troublesome. In Stirling, they contemplated this year taking down the still altogether to get it cleaned. He thought that makers, when they were designing stills, should give more consideration to the question of making provision for cleaning. There was a great

tendency among makers to cut down, for cheapness, the weight of the metal and the size of the still. He noticed, on the occasion of their visit to Bedlay, where there were sulphate stills, the provision made for cleaning them. There were big manholes, into which a man could get. This showed the difference between plant designed by a maker and that designed by the person who was going to pay for and work it. Mr. Smith commented upon the disposal of the "devil" liquor. He (the President) thought it was the usual practice in small works to put this liquor through the still, which was the best way to get rid of it; but probably easier methods were adopted in some places. He believed in conducting tests very often, to see that all the ammonia was being taken out of the liquor, which could only be done by strict supervision over the working of the plant and the frequent testing of the spent liquor. He believed also in testing the salt, to see that it was being kept up to the proper strength. The figures given by Mr. Smith showed exactly what it cost to make a ton of sulphate of ammonia. There was included in the figures the price of the liquor. He assumed that the price stated for the liquor was what Mr. Smith got for it before installing the sulphate plant; and if this were the case, then apparently they were making £2 more profit per ton of salt in Dumfries than they were doing before they had the plant. This proved conclusively that it paid to instal sulphate plant in any gas-works making (say) above 15 million cubic feet per annum.

Mr. SMITH thanked the members for the way in which they had discussed his paper; the remarks made upon it having, he said, been very gratifying. A question was raised about the strength of the liquor. It was thought that 4½° Twaddel would be more suitable. On account of the way in which they were placed for the storage of liquor, they could not very well come much below 5°, especially in winter. If they had more storage they could work with a smaller percentage, and he thought 4½° would be better than 5°. As to the suction-pipe on the pump, it was meant to do both the tar and the liquor with one pump. The yield of ammonia—25·5 lbs. per ton—might seem small; but with the class of coal they were using at Dumfries they were well up to the average of places getting 30 lbs. and upwards. From the attention they had paid to the escapes of ammonia, he did not think they would get much more than 25·5 lbs. A question was raised as to the discharge of waste liquor from the float-valve. What he meant to bring before the members was that when the liquor in the bottom chamber came to a certain height it lifted the float, and let the liquor away intermittently, in very large quantity. It was never absolutely shut off; but when the pressure became so great as to entirely lift the float out of its seat, there was a considerable discharge. The syphon was kept full of acid; the atmospheric pressure on both sides being the same. They were at equal pressure and dead-level; and both the pipes were sealed. It might be that hand-holes for cleaning out the still were sometimes found to be too small; but if attention were paid to the working of the plant, and good, clean lime used, attention being given to the liming, he thought it would be found—at least, he had always found it—that the present size of liming-door was ample for cleaning anything out which might be there. They could get in a small rake to bring anything forward, which, in their case, was very little, because they washed everything out about fortnightly, while the still was hot. If this were not attended to, they might get incrustation, which they did not. The price of sulphate of ammonia he had given was the average for this year. The profit on the plant for the past twelve months was £263. He hoped it would be considerably increased this year—as matter of fact, he had no hesitation in saying it would be.

On the motion of the PRESIDENT, a hearty vote of thanks was accorded to Mr. Smith for his paper.

The Midland Junior Gas Engineering Association will hold their fifth annual general meeting at the City of Birmingham Technical School next Saturday. In addition to the formal business, Mr. B. J. Bell will read a paper entitled "Competition and the Development of Gas Sales."

Manchester and District Junior Gas Association.—We learn from the Hon. Secretary (Mr. J. Alsop) that Professor Harold B. Dixon, F.R.S., has kindly consented to give the members a lecture, entitled "Some Theories of Combustion in Gases," next Saturday afternoon at the Victoria University, Manchester; and on the 30th prox. he will give another, on "The Explosion Wave in Gases."

The Scottish Junior Gas Association (Eastern District) are to hold their seventh annual general meeting in the Heriot-Watt College, Edinburgh, next Saturday. After the formal business, Mr. A. Morton Fyffe, of Dundee, is to read a paper descriptive of the new luteless purifying system at the Dundee Gas-Works, and Mr. H. E. Doran, of the Granton Gas-Works, one entitled "The Formation of Coal."

Gas and Electric Cables.—A correspondent of the "Electrical Review," who is responsible for a system of underground mains, double steel armoured and lead covered, laid direct in the ground, has found the armouring, bitite yarn and lead, completely eaten through in places where he has also found leakages of gas. "There appears to be," it is remarked, "more than a chance connection between the two circumstances; and he would be glad of any information bearing on the point that any of our readers may be willing to furnish."

DETERMINATION OF CARBONIC OXIDE IN ILLUMINATING GAS BY IODINE PENTOXIDE.

A recent issue of the "Journal of Industrial and Engineering Chemistry" contained an article on the above-named subject, by Messrs. AUGUSTUS H. GILL and EDWARD H. BARTLETT, from which the following are extracts.

The reaction made use of in this method for the quantitative determination of carbon monoxide is that first indicated by Ditte. He showed, in 1870, that if carbon monoxide was passed over iodine pentoxide at temperatures between 150° and 200° C., a reaction ensued by means of which the carbon monoxide was oxidized to carbon dioxide; this action being accompanied by a simultaneous reduction of the iodine pentoxide to free iodine, expressed by the following equation:

$$I_2O_5 + 5CO = I_2 + 5CO_2.$$

An analogous reaction is produced by iodic acid—

$$2HIO_3 + 5CO = I_2 + 5CO_2 + H_2O.$$

Apparently the first to actually make use of this reaction were De la Harpe and Reverdin, who used it in 1888 for the detection of carbon monoxide in the atmosphere. In 1898, both Nicloux and Gautier report having used this reaction quantitatively; both confining their attention to the determination of carbonic oxide in the small quantities in which it is met with in the air.

The problem of adopting the reaction for use in the determination of the carbonic oxide in the atmosphere, was taken up by Kinnicutt and Sanford in 1899. By way of premise, they say that all the methods which have been used for this purpose may be divided into two classes—viz., those employing the reaction between carbon monoxide and the hæmoglobin of blood by means of which carbon monoxide hæmoglobin is formed, and those in which carbonic oxide is oxidized to carbon dioxide. The processes of the first class are of but little value from a quantitative standpoint. The most suitable oxidizing agent for use in the processes of the second class has been found to be iodine pentoxide. They report that they experimented with the methods of Nicloux and Gautier, and failed in both instances to obtain accurate results. They then proceeded to devise a method of their own, which is a modification of that of Nicloux. They passed the air first through a tube containing pieces of stick potash and one containing sulphuric acid, in order to remove from it sulphuretted hydrogen, sulphurous acid, and similar reducing gases, and all unsaturated hydrocarbons. They then sent the air through a tube containing iodine pentoxide heated to a temperature of 150°, after which it was passed into a solution of potassium iodide, which absorbed the iodine. Finally, they tritrated this solution with a N/1000 sodium thiosulphite solution to determine the iodine. By measuring the carbonic oxide used in making up their samples in capillary tubes, they were enabled to read the volume to 0·001 c.c. The content of carbonic oxide varied from 1 part in 2440 parts of air to 1 part in 43,479 parts of air. They report the results of fourteen analyses, which show the method to have been very accurate. They found they could determine as little as 2·5 volumes of carbonic oxide in 100,000 volumes of air. They next made experiments to determine whether or not the presence of illuminating gas in the air would vitiate the accuracy of these results. They found that the presence of the gas had no disturbing effect whatever.

In 1900, Smits, Raken, and Terwogt, of the University of Amsterdam, proposed utilizing this oxidation of carbon monoxide for its quantitative determination in the analysis of illuminating gas. After reviewing briefly the work of Nicloux and Gautier, they say it is obvious that this "very sensitive" reaction, heretofore only used in the analysis of air, is also applicable to the determination of carbon monoxide in illuminating gas. They remark, however, that it is out of the question to think of placing the carbonic oxide determination in line in a complete gas analysis, if the exact method of either Nicloux or Gautier is used. They therefore modified Gautier's method, and proceeded as follows: The gas from which the carbon dioxide, the illuminants, and the oxygen had been removed in the ordinary Hempel scheme of analysis, was passed from a Hempel burette, through a U-tube containing iodine pentoxide heated to 150° C. by an oil-bath, into a Hempel pipette containing a solution of caustic potash. The caustic potash absorbed the carbon dioxide formed by the oxidation of the carbonic oxide, so that the contraction in volume after the absorption was complete gave the volume of the latter. The correction for the vapour tension of iodine was found negligible.

It does not appear from their article that they ever actually tried their method in an actual analysis of illuminating gas. They did, however, undertake to find out whether or not hydrogen or methane would undergo oxidation on being passed through the iodine pentoxide tube. To this end they made by their method an analysis of a mixture of hydrogen and carbon monoxide, and another analysis of a mixture of methane and carbonic oxide. They report the following results (in cubic centimetres):—

	Found.		Mixed.
Hydrogen	72·7	..	72·6
Carbonic oxide	8·7	..	8·8
Methane	42·7	..	42·8
Carbonic oxide	8·1	..	8·0

It will be noticed that they give results for two experiments only, and that neither of these properly represents the conditions

of practice, as in neither were both hydrogen and methane associated with the carbon monoxide. They do not hesitate, however, to say that their method is very exact, and much superior to that in ordinary use.

The method of determining carbonic oxide by cuprous chloride is so unsatisfactory that it was thought this promised well; and their work was repeated, with the following results:—

Absorption of Carbonic Oxide by Iodine Pentoxide.

CO Used.	CO Found.	Loss.	Per Cent. Lost.	Bath Temp.	Time, Minutes.
21·8	20·8	1·0	3·6	150	90
23·2	22·2	1·0	4·3	150	150
25·9	25·5	0·4	1·0	152	32
25·6	25 6	0·0	0·0	154	29
26·4	26·0	0·4	1·0	161	32

In the last three results, the carbonic oxide was mixed with air. It will be noticed that after 2½ hours' passing of the gas through the tube, more than 4 per cent. of the gas remained unabsorbed. This would seem to show the impracticability of the method.

To still further test it, a mixture of carbonic oxide, methane, hydrogen, and nitrogen was made, of about the composition of that left after the carbon dioxide, illuminants, and oxygen had been absorbed from an illuminating gas, and passed through the iodine pentoxide. The results are shown in the following table:—

Absorption of Carbonic Oxide by Iodine Pentoxide from a Mixture of Gases.

Hydrogen.	Methane.	CO Added.	CO Found.	Gain.	Per Cent. of Gain.	Bath Temp.	Time. Min.
24·1	44·8	25·6	28·5	2·9	11·3	157	24
24·4	42·3	26·4	31·3	4·9	18·6	152	29
23·6	46·1	25·6	27·1	1·5	5·9	152	28
26·1	46·2	24·1	27·1	3·0	12·4	152	51
24·6	53·5	25·7	28·1	2·4	9·3	152	75
20·4	43·7	27·8	31·5	3·7	13·3	148	30
24 0	46·0	26·1	26·9	0·8	3·1	150	26

It will be noticed from this table that the carbonic oxide found considerably exceeds the amount originally added. The errors of the analysis are not sufficient to account for this; and they show no regularity. Moreover, another observer a year previously had obtained almost identical results; the average error found by him being 7·8 per cent., whereas the average error of these results is 9·1. This, as was shown by two different observers working independently, is not due to the action of the iodine pentoxide upon either the methane or the hydrogen, nor to the number of times the tube had been used, nor to the length of time taken by the gas in passing through the tube, but may be due to breaking-up of the iodine pentoxide.

In conclusion, it may be said that the method of absorption of considerable quantities of carbonic oxide by iodine pentoxide is inaccurate, irregular in action, and tedious and troublesome to use.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills presented and read the first time: Abertillery and District Water Board Bill, Handsworth Urban District Council Bill, Maltby Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, Thorne and District Water Bill.

Bills presented, read the first time, and referred to the Examiners: Ammanford Gas Bill, Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Cambridge Water Bill, Farnham Gas and Electricity Bill, Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Gowerton Gas Bill, Great Grimsby Gas Bill, Havant Gas Bill, South Lincolnshire Water Bill, Southend Water Bill, Wicklow Gas Bill.

The opposition to the Ammanford and Garnant Gas Bills has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Bradford Corporation Bill, Egremont Urban District Council (Gas) Bill, Little Hulton Urban District Council Bill, Mallow Urban District Gas Bill, Middlesbrough Corporation Bill, Middleton Corporation Bill, Rhondda Urban District Council Bill, Warrington Corporation Bill, Worksop Urban District Council Bill.

Watford Gas Company.—At the half-yearly meeting of the Company on the 24th ult., the Directors reported a profit of £4207; the revenue having been £20,579 and the expenditure £16,372. The amount available for distribution was £7049; and the Directors recommended dividends for the half year at the rates of 7¼ and 5¾ per cent. per annum on the two classes of capital stock, less income-tax. The quantity of gas made in the half year was 121,497,590 cubic feet, of which 117,086,600 cubic feet were sold and 118,341,700 cubic feet accounted for. The report was adopted, and the dividends were declared.

LEGAL INTELLIGENCE.

RATING OF THE LIVERPOOL WATER-WORKS.

At the Preston Quarter Sessions last Wednesday, the CHAIRMAN (Mr. H. Worsley-Taylor, K.C.) delivered the judgment of the Court in a case in which the Mayor and Corporation of Liverpool were the appellants and the Assessment Committee of the Chorley Union and the Overseers of Withnell the respondents. The appeal was heard at a recent session (see *ante*, p. 49), and judgment was reserved.

The CHAIRMAN, giving judgment, said that, of the seventeen original items in dispute, sixteen had been abandoned; leaving only an assessment on "water-works, reservoirs, pipes, and appurtenances," and "land used as a gathering-ground for water," at a rateable value of £3672. It had been agreed between the parties that the water-works, &c., should be fixed at £2400; leaving £1272 as the assessment on the land. This land measured 1165 acres; and the actual valuation of it was £1165 net. Two questions were at issue: (1) Whether the Corporation were assessable at all, in respect of this gathering-ground, as being in occupation of it; and (2), if so, whether on the value of £1165 or what other value. The Corporation had originally acquired only the land necessary for their reservoirs, &c., enjoying the water which naturally flowed into them from the adjoining lands, belonging to other owners; but, many years later, in order to avoid possible pollution, they determined to acquire the lands so as to control their user. This they did at an average cost of £26 10s. per acre, though in other parts of the general watershed they had paid as high as £409 per acre. The whole area purchased was about 10,000 acres; and the average price was £45 5s. per acre. In regard to the land generally, the Corporation's policy had been to limit the occupation of it to sheep farming, forestry, and sporting; and of the land immediately in question they had devoted 306 acres to forestry. The remainder (859 acres) was moorland; and the sporting rights over the whole 1165 acres were let on lease. The facts as to the 859 acres were that the Corporation had simply left the land unoccupied; and Mr. Ryde (for the respondents) admitted that mere keeping the land vacant, excluding trespassers, or the retaining of a fence round it, could not *per se* involve rateability. He submitted, however, that the purpose of purchase, and the retention of control, were ample evidence of occupation. Mr. Macmorran, on the other hand, contended for the appellants that the obvious intention of the Corporation was to keep the land as unoccupied as possible. It did not appear to the Court that the exercise of a number of acts of ownership, no one of which singly amounted to occupation, amounted to it in combination, and it appeared to them that there was this fundamental distinction between this case and all others of which they were aware in which there had been held to be rateable occupation—that in all these cases there had been actual outward physical user of the hereditament, either existing or intended, and that in this case there was no such user. In all these cases absence of user would have meant failure of the purpose for which the hereditament was acquired. In the present case this was not so. [Reference was made to several cases in support of this view.] Here there was no intention in fact to occupy, but simply to control, and financially to be content with the measure of occupation of the shooting tenant. The Corporation undoubtedly obtained a benefit, in a sense, from the land, but not from user of it by them. The benefit arose from the power to prevent an injurious use of it. Therefore it appeared to the Court that the main case relied on by the respondents failed. With regard to the subsidiary point raised—that from the simple ownership of the land the Corporation enjoyed the flow of water from it—the Court held that the mere impounding of the water running from the land could not in itself convert their ownership into occupation, for they enjoyed that water before they bought the land, and simply took steps to secure its purity. The Court were therefore of opinion that the Corporation were not occupiers of the 859 acres of moorland so as to render them rateable, and the rate must be amended accordingly. As to the 306 acres of forestry land, the Corporation contended that they should be rated under the Rating Act of 1874 at their unimproved rental value, which they put at 2s. per acre, and a section of 9 acres used as a nursery ground at 15s. per acre. After considering a number of decided cases dealing with enhanced values, the Court considered that the contention of the respondents was an extension of the doctrine of enhanced value which was not warranted by the facts nor the principles of any decided case of which the Court were aware; and they therefore accepted the Corporation's figures. The result was that the Court decided for the Corporation on both points, and the appeal must be allowed, with costs. A case would be stated if the respondents so desired, especially as the Court understood this was a test case.

Mr. GORDON HEWART, on behalf of the Chorley Union, applied for a case.

A question was raised as to costs; and it was agreed that they should be taxed out of Court and a special case stated.

An Action Against Gas Directors.—In the "JOURNAL" for Dec. 1, 1908 (p. 644), there was a report of a motion on behalf of the defendants in the case of *Jones v. Aberystwyth Gas Company* to stay proceedings, on the ground that the action was frivolous and vexatious. It was stated that the action (which the High Court of Justice dismissed with costs) was taken by the plaintiff, on behalf of himself and other shareholders, against the Company and the Directors, with regard to whom certain allegation extending to mismanagement and the retention of moneys which belonged to the Company, were made. Evidently, this dismissal did not conclude the matter; for the report of the Directors on the past half-year's working of the Company contains a statement to the effect that the long pending litigation has been closed; the plaintiff withdrawing his claims and the Company their counterclaims—the several parties paying their own costs.

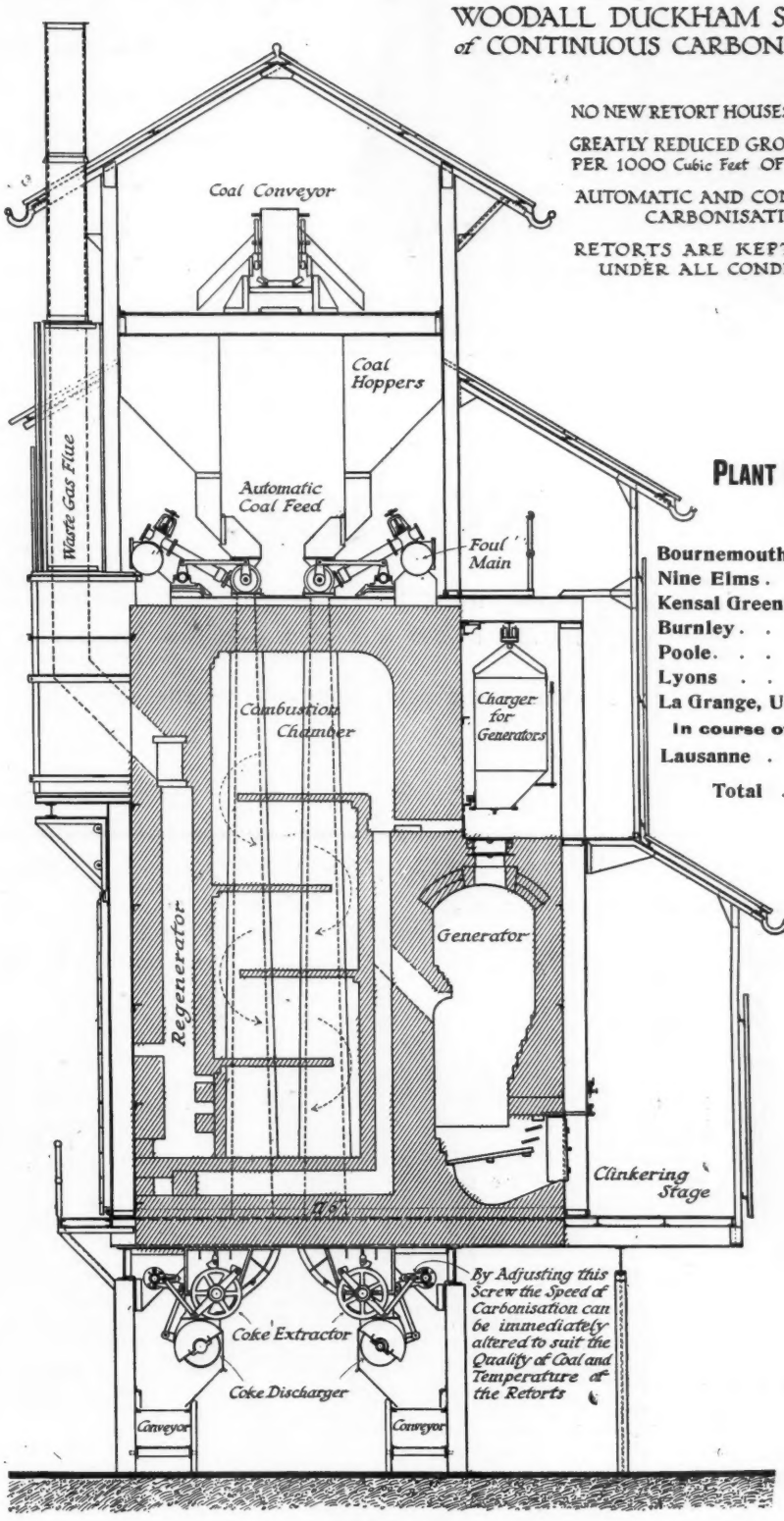
WOODALL DUCKHAM SYSTEM of CONTINUOUS CARBONISATION

NO NEW RETORT HOUSES REQUIRED

GREATLY REDUCED GROUND SPACE PER 1000 Cubic Feet OF GAS MADE

AUTOMATIC AND CONTINUOUS CARBONISATION

RETORTS ARE KEPT CLOSED UNDER ALL CONDITIONS



— CROSS SECTION —

PLANT ERECTED.

	Cubic Feet per Diem.
Bournemouth	400,000
Nine Elms	125,000
Kensal Green	1,250,000
Burnley	1,125,000
Poole	50,000
Lyons	125,000
La Grange, U.S.A.	125,000
In course of Erection—	
Lausanne	1,500,000
Total	4,700,000

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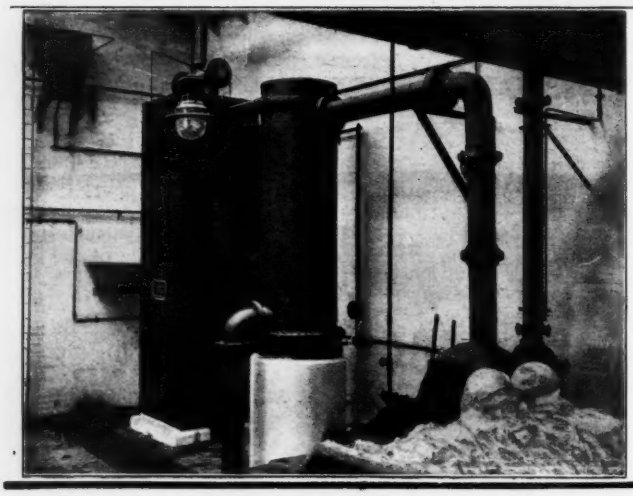

W. C. HOLMES & Co.,

LONDON,

And Whitestone Iron Works,

HUDDERSFIELD.

SULPHATE OF AMMONIA PLANT

recently erected at

WALLASEY GAS-WORKS.

NOTICE.

Full Particulars regarding the MERRIFIELD-WESTCOTT-PEARSON Water Gas Plants may be had on application to the Patentees at

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Anti-Vibrator and Gas Adjuster.

J. & W. B. S's Patent.

Made to suit most Types of Inverted Burners.

Actual Size.

BRITISH MADE.

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"BESTLITE"

An Ideal Burner for use with Flexible Tube Pendants or Anti-Vibrators.

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11,456 Burner only . . **39**/- „ „

The "FARRINGDON"

Indoor Lamp.

125 c.p. per Burner.

White Enamelled with Gold Lines.

With Gas and Air Regulators to Burners.

COMPLETE AS DRAWN.

12,426 **2**-Light **35**/- **3**-Light **38**/- each.
12,425.—Do. without Reflector, **2**-Light **32**/- **3**-Light **35**/- each.

* *Subject to our usual Trade Discount.* *

J. & W. B. SMITH,

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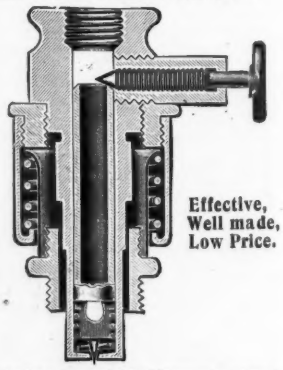
"COMPACT"

Anti-Vibrator.

SECTIONAL ILLUSTRATION.



Effective, Well made, Low Price.

Showing how the weight of Burner is taken by the Spring confined in the case of the Anti-Vibrator. It will also be seen that Gas cannot gain access to the Anti-Vibrator.

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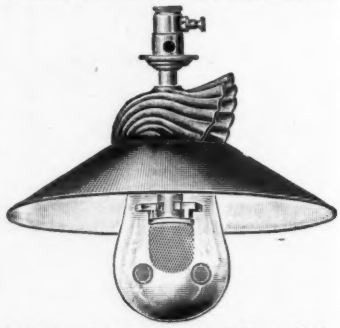
Specially suitable for Shops, Factories, &c.



12,428 Complete as shown **46**/- doz., *subject.*
12,427 Burner only **34**/- „ „

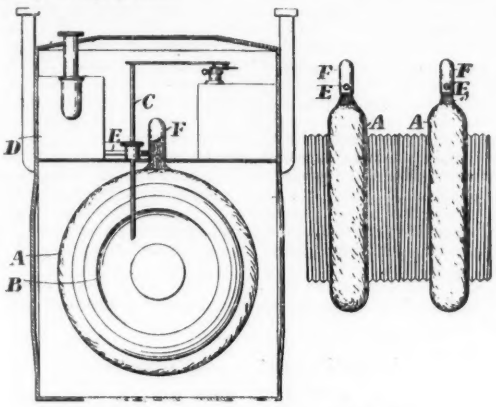
REGISTER OF PATENTS.

Automatic Oiling Devices for Gas-Meters.

DALY, J. R., of New Orleans, U.S.A.

No. 2118; Jan. 28, 1909.

This device is to provide means whereby the diaphragms of a gas-meter may be kept pliable.



Daly's Dry-Meter Diaphragm Lubricator.

In practice, the gas flowing through the meter brings into action the two diaphragms A, which operate the two discs B and the diaphragm shafts C. The oil reservoir D (which can be filled without opening the measuring chamber) is formed by the index chamber of the meter, and has two feeding tubes E connected with wick-holders F. The wicks form a brush through which the oil flows; and they impinge against the periphery of the diaphragm. "The oil in the reservoir supplies the wicks by gravitation and capillary attraction, and permeates the material of which the diaphragms are made; so that the same are lubricated in a satisfactory manner, and the fabric of the periphery of the diaphragms is kept pliable and does not become dry or crisp, as is usual in the ordinary dry meters now in use."

Vertical Retorts for the Destructive Distillation of Coal—The "Coalite Process."

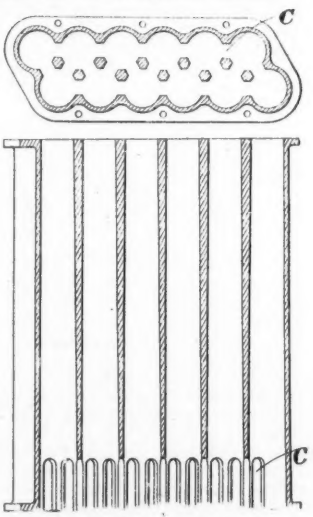
PARKER, THOMAS, of Wednesfield.

No. 3003; Feb. 8, 1909.

This invention relates to a battery of integrally cast vertical retorts for the destructive distillation of coal, and more particularly to patent No. 14,169 of 1908 ("Coalite Process.")

In the destructive distillation of coal in vertical retorts, the patentee points out, difficulty is in some cases experienced in the extraction of the gas from the retorts by reason of the melted coal in the upper part of the retort choking the upper part, and inasmuch as the outlet of the gas is at the upper end of the retorts, the gas accumulates in the lower part of the retort. This invention has for its object to avoid this defect, and to provide "means for completely withdrawing gas from either end of the retort throughout the period of distillation, and to avoid the temporary choking of individual retorts."

Accordingly, the inventor provides a slot substantially vertical or parallel to the axis at the lower end of each retort, by which communication is established directly between adjacent retorts or through connecting channels or passages, so that thus, in case of the temporary choking of any one retort of the battery, the outlet is available for gas accumulating through one of the adjacent retorts.



Parker's Vertical Retorts—Coalite Process.

The invention is shown in the illustration—a sectional plan of a battery of retorts, and a sectional elevation corresponding thereto.

The battery of vertical retorts is in a single and integral casting, and the retorts are of small diameter in two series, alternating one with the other, united, and provided above and below with common flanges. The respective retorts are so arranged that each retort communicates with the next adjacent to it towards the lower extremity, so that an inter-communicating space or slot or passage C is formed at the lower end of adjacent retorts—all the retorts being free to deliver their gases into a discharge chamber at the upper end, common to the battery.

The specification concludes: It will be understood that the respective retorts are of relatively small diameter, and that they gradually taper outwardly towards their lower extremity—thus increasing in diameter. It will also be understood that an inter-communicating space or slot of any shape may be provided without departing from the invention. It has been previously proposed (in an arrangement of retorts in two rows) to connect the bottom mouthpiece of each retort to the bottom mouthpiece of the retort facing it in the next row, by means of a passage controlled by a valve.

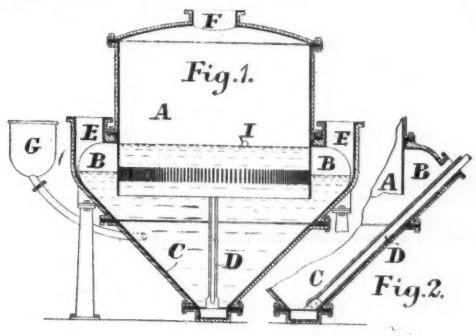
Sulphate of Ammonia Saturators.

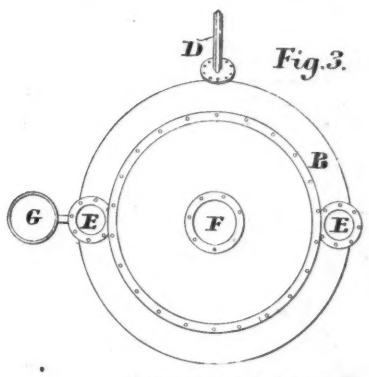
WILTON, G. & N., of Mark Lane, E.C.

No. 3036; Feb. 8, 1909.

In the use of saturators of the ordinary construction, it is pointed out in the specification of this patent, the ammonia distributing pipes lie around the bottom of the saturator chamber (inside the walls), and if the saturators are used for producing sulphate of ammonia direct from gas charged with ammonia, the pipes become choked with tar, and sometimes a mixture of tar and sulphate becomes piled up on top of the distributing pipes. "It would not be a difficult matter to wash out the sulphate with water, but the tar is difficult to remove in this way. Again, in using saturators for making sulphate of ammonia from gas direct, the saturators are necessarily of much larger dimensions than usual, so as to secure a large bubbling area.

The object of this invention is to provide a construction of saturator wherein, among other advantages, a large bubbling area is provided in a comparatively small saturator, while no corners are provided in which the tar can become deposited with the crystals. Provision is also made for the ready removal of the tar.





Wilton's Sulphate Saturator.

Fig. 1 is a sectional elevation of one construction; fig. 2, a part section; and fig. 3, a plan.

The upper chamber A is circular, and is surrounded by an annular gas-channel B at its lower edge, forming the upper edge of the tank C beneath. This tank may be more or less conical, and formed with a recessed base in which the base of the usual sulphate of ammonia discharger or ejector will be placed. The discharge pipe D, with its air or steam pipe, is led upward through the side of the chamber C, or through the roof of the upper chamber A. Gas inlets E are provided in the upper part of the gas-channel B, and there is a gas-outlet F in the upper chamber. The inlet for the supply of solution is arranged in the usual manner, with an extension above the liquid level as at G.

The apparatus may be built of iron lined with lead; the lead lining being carried into the flanged joints. The part of the upper chamber A, which extends into the lower one to form the inner wall of the gas-channel B, is in the form of a circular apron made entirely of lead, copper, or other suitable alloy or substance. The apparatus may conveniently be built up of jointed sections—namely: (1) A cylindrical shell forming the walls of the upper chamber; (2) a cover jointed to it; (3) the upper part of the lower conical tank C and gas-channel B jointed by flanges at the upper edge to the cylindrical shell A; and (4) the base of the conical tank C flanged and jointed to the upper part. The sides of the conical tank are supported by brackets or standards from lugs on the upper part of the tank. I is a pipe for drawing off the tar.

If the saturator is to be employed for making a saturated solution

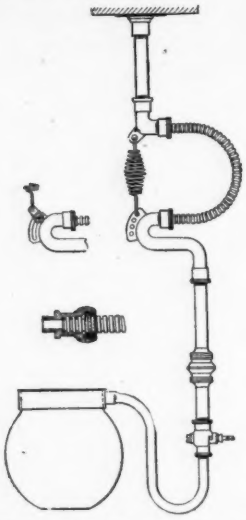
which is to be discharged and made into crystals in another vessel, the tank would be formed with a flat base; the saturated solution being run off as required by a suitable pipe.

Anti-Vibrators for Incandescent Gas-Lights.

M'Millan, A., of Bolton.

No. 7153; March 25, 1909.

This invention refers to "anti-vibrators" made by connecting an upper elbow or bend to the usual gas-supply pipe; and to it is connected a lower elbow or bend by a flexible tube and a spiral spring. The inclination of the pendant portion which carries the burner is regulated by adjusting the spring through a suitable attachment to the elbows or bends. The jointing may be effected by stuffing-boxes and threaded nuts or bushes, or by soldering.



M'Millan's "Anti-Vibrator" Gas-Pendant.

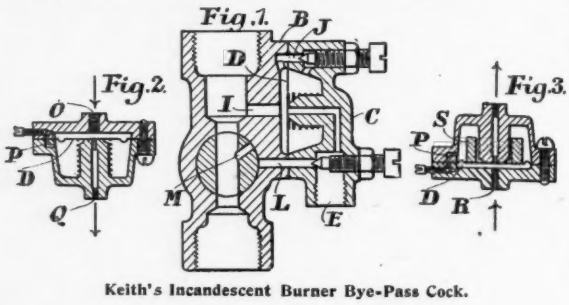
The illustration shows an elevation of the "anti-vibrator" gas-fitting; an alternative mode of connecting the suspension spring to the elbow or bend; and a sectional view of one of the stuffing-boxes for coupling the flexible tube to the elbows or bends.

Bye-Pass Cocks for Incandescent Burners.

Keith, J. & G., of Farringdon Avenue, E.C.

No. 4290; Feb. 22, 1909.

The invention consists in controlling the gas-outlet by means of a diaphragm which bears directly on a seat connected with the outlet—thus dispensing with the use of a separate valve connected to the diaphragm for controlling the gas-outlet, and "so permitting small quantities of gas to be dealt with under large variations of pressure."



Keith's Incandescent Burner Bye-Pass Cock.

Fig. 1 is a vertical section of a bye-pass cock with the governing device; figs. 2 and 3 show forms of the governing device.

The cock (of the usual plug-type) is formed at one side with a flange B, between which and the face of an adjacent casing C a metallic diaphragm D (preferably of silver) is interposed. The casing has an outlet E, to be connected to the pilot light or other supply pipe, and provided near the centre with a valve-seat against which the diaphragm bears in opposition to a helical spring. A port is led from the valve-seat to the outlet E. Gas is admitted from the inlet of the cock to one side of the diaphragm through a port I in the cock; while a bye-pass port J, adjacent the edge of the diaphragm and controlled by a screw, admits gas to the other side of the diaphragm. The bye-pass port communicates with the outlet E leading to the pilot light or other supply pipe.

The action of the device is as follows: A supply of gas is admitted to the side of the diaphragm nearest the body of the cock by means of the port I, and finds its way, by the port J, to the other side of the diaphragm, and thence, through the valve-seat, to the connection E, to which the bye-pass tube is attached. As there is always plenty of gas on the inlet side of the diaphragm, and as the port J leading to the other side of the diaphragm is checked-down, the tendency is for the pressure to push the diaphragm towards its seat, and thus partially close the outlet on that side. This has the effect of immediately giving an increased pressure on the outlet side of the diaphragm, which, in conjunction with the pressure of the spring, brings about a state of balance. This balance is maintained whether the pressure on the inlet I is high or low; so that the difference of pressure between the inlet and outlet side of the diaphragm—in other words, between the inlet and outlet of the port J—is always the same. This being so, it follows that any fixed position of the regulating screw will always allow approximately the same quantity of gas to pass.

The casing C, with ports and diaphragm as described, may be adapted to operate independently of the cock; but when used in conjunction with it, an additional advantage is obtained, in that the cock is adapted to give a controllable flash on being operated to admit gas. This is provided for by forming in the barrel of the cock a port L communicating with the bye-pass outlet E leading to the pilot light, and forming a corresponding port M in the plug of the cock; so that when the last-mentioned port passes the port in the barrel, high-pressure gas is allowed to flow momentarily to the outlet leading to the pilot light, and at the same time gas is admitted to the burners.

As shown in fig. 2, the governing device is arranged to act independently of the cock. The gas supply enters at O and presses on the upper surface of the diaphragm, so that it tends to force it on to its seat against the action of the spring. P is the bye-pass connecting both sides of the diaphragm, and Q is the outlet to the pilot light, burner, or the like.

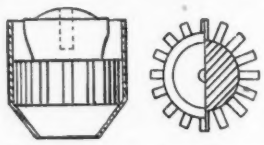
The construction shown in fig. 3 is similar to fig. 2, except that the gas supply enters at R, and for the spiral spring is substituted a sliding weight S.

Incandescent Gas-Burners.

Heaton, C., of Skegness.

No. 10,309; April 30, 1909.

This invention relates to incandescent gas-burners in which the usual gauze diaphragm, or its equivalent, is dispensed with, and an annular passage is arranged for the mixed air and gas by placing the block for holding the mantle support in the enlarged upper end of the mixture-tube in such a way as to leave a space between it and the



Heaton's Upright Incandescent Burner Head.

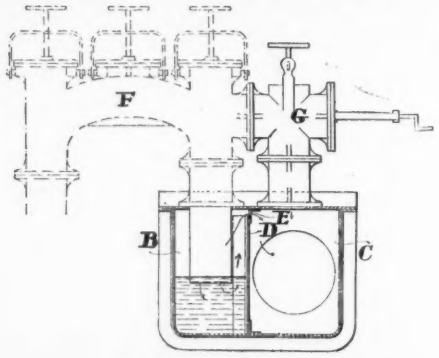
mixture-tube. The block is, as heretofore, provided with radial projections, which rest above the flange in the mixture-tube where the enlargement commences; but, in addition to being arranged radially, the projections run axially of the block, so as to form a series of passages for the mixed air and gas in a direction axially of the block.

Hydraulic Mains.

Wright, J. C., of West Ham.

No. 11,059; May 10, 1909.

This invention has for its object to so construct and arrange hydraulic mains that they can be used as wet or dry mains at will by operating a bye-pass valve or some equivalent device attached to the arch-pipe, with the result that, when working as dry mains, there obtains the separation of denser tars quickly, allowing the gas to go forward with the lighter hydrocarbons, and leaving them free to be carried forward with the gas, and at the same time keeping the tar warm.



Wright's Hydraulic Mains.

The main as a whole is divided into wet and dry mains B and C by a baffle-plate D extending from the bottom of the main to within a short distance from the top, leaving a longitudinal space E for the passage of gas from B to C.

When working as a dry main, the bye-pass valve G, which is attached to the arch-pipe F, is opened, with the result that the heavy tar falls into the main B, leaving the lighter hydrocarbons free to pass through the valve G with the gas into the dry main C. When employed as a wet main, the valve G is closed; the gas, tar, &c., flowing together down the usual dip-pipe, and through the ammoniacal liquor seal—leaving the tar within the main B. The gas escapes into the main C by way of the opening E.

The tar from the main B can be drawn off in any suitable manner,

and the main C must be kept drained; so that the gas does not flow along the hydraulic main together with the tar and the other denser products.

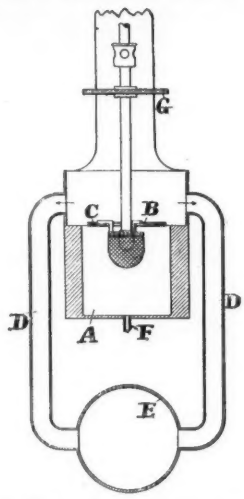
A quick separation of all dense tarry matters from the gas is thus effected, as it is made, and the gas is allowed to flow away along the dry main free of these, and, further, by reason of the hot gas passing along the dry main, the tar within the wet main is kept warm, and prevented from becoming thick.

Forming and Hardening Inverted Incandescent Mantles.

NEUE KRAMERLICHT G.M.B.H., of Charlottenburg, Germany.

No. 12,579; May 27, 1909. Date claimed under International Convention, May 29, 1908.

This invention—relating to "forming and hardening incandescent bodies for downwardly burning incandescent gas-lights and means for carrying this process into practice"—consists in heating the incandescent fabric very highly during the hardening period (in order to obtain a more complete sintering of the metallic oxide in a short time). This object is "attained owing to the fact that, during the forming by means of the burner fed with compressed gas, the incandescent body is enclosed in a chamber from which the air is largely excluded; the transmission of heat being thereby prevented as far as possible."



The New Kramer Light Company's Inverted Mantle Machine.

The arrangement for carrying the process into practice is illustrated in vertical section. It consists of a trough-shaped receptacle A lined with refractory material; the mantles being suspended in recesses B in a strip C resting upon it. A number of tubes D are fitted to the upper widened part of the receptacle on both sides; their other ends opening into a chimney E, by means of which the products of combustion are drawn away by natural or artificial draught. In the bottom of A passages F are provided, through which fresh air can be introduced into the chamber and flow in counter-current to the flame, or compressed air can be introduced when this is necessary for the purpose of effecting complete combustion. The burner-bench G, carrying all the compressed gas-burners, is movable upwards and downwards, as usual, by means of guides.

The hardening of the mantles is effected in the following manner: After the incandescent bodies have been inserted in the recesses B of the strip C, the latter is arranged as shown, whereupon the burner-bench G is moved upwards and downwards in the usual manner, and simultaneously the exhauster, or other suction device used, is operated and connected with the tubes D E. The kindled compressed gas-burners, owing to their movement, "sinter the incandescent bodies throughout their entire length, and at the same time impart the permanent arched form to them."

While in the usual processes the time required for hardening amounts to three minutes, the operation is said to be effected in two minutes by the present process, with the further advantage of increased strength of fabric; also the "duration of the operation is reduced and the gas economized."

Inverted Burners for Incandescent Gas-Lamps.

KIRSCHKE, E., of Charlottenburg, Germany.

No. 16,091; July 9, 1909. Date claimed under International Convention, July 31, 1908.

This invention relates to an inverted incandescent burner for lighting railway vehicles. The essence of the invention resides in the fact that, by the removal of the mixing-tube of the bunsen burner (which is detachable in the usual manner), the nozzle is simultaneously moved into such a position that it is readily accessible—thus presenting the advantage that the clearing of the discharge aperture can be conveniently effected without risk of widening the nozzle aperture. In the operative position, the arrangement is such, however, that the nozzle and the mixing-tube constitute a rigid whole, in order to prevent any current of gas and air being drawn into the mixing-tube and being deflected owing to an alteration in the relative positions of the several parts of the burner.

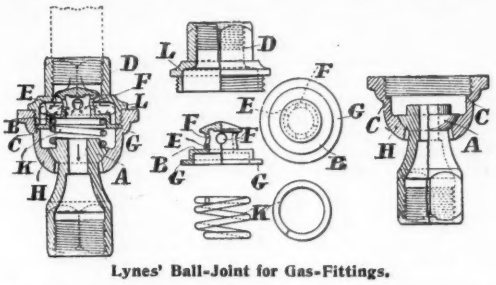
Ball-Joints for Gas-Fittings.

LYNES, W., of Birmingham.

No. 17,158; July 23, 1909.

The object of this invention is to provide ball-joints with means for intercepting the solid particles in suspension in the gas, so as to prevent them being deposited on the surfaces of the joint.

The trap or interceptor is carried by a diaphragm or plate arranged transversely across the interior of the fitting, above the spherical members of the joint, so as to separate the latter from the incoming gas—the dust being deposited upon the upper side of the diaphragm.



Lynes' Ball-Joint for Gas-Fittings.

A vertical section through the joint is shown; the several parts of the joint being separated.

A represents the ball element of the joint, above which is the trap or interceptor. This consists of a plate or diaphragm B supported upon an annular shoulder or collar C formed around the interior of the body H of the fitting, between the inlet D and the outlet through the ball part of the joint. The middle part of the plate carries a boss or raised part E, pierced around its sides with a series of holes or gas-ways F, which make communication between the one side of the plate and the other. The top of the boss is formed as a deflector cone or crown baffle with base larger in diameter than the boss, while its apex is presented to the centre of the inlet D; whereas the outer part of the plate is formed with a set-down shoulder G, so that, when the plate is inserted upon the collar C in the cup H, an annular recess is formed, which serves as a trap or receptacle for the intercepted dust. The arrangement is such that the stream of gas, on entering the inlet, impinges against the cone or crown, and is thereby deflected towards the interior walls of the body of the fitting, which cause any solid particles that may be in suspension in the gas to be deposited in the groove formed by the shoulder G, after which the gas, deprived of the intercepted solid matter, passes through the gas-ways F in the sides of the boss to the underside of the interceptor, and proceeds thence, through the ball part of the joint, to the burner. The plate B is held in position by clamping it between the shoulder C of the cup and the lower edge of the cover or top portion L of the fitting. In order that the joint may not work too freely, and so be liable to move inadvertently, a spring K is interposed between the top of the ball part and the interceptor plate; the downward pressure of the spring on the ball part causing a stiffness between the bearings of the joint.

Filaments for Mantles of Incandescent Gas-Lamps.

LAIGLE, R., of Paris.

No. 17,771; July 30, 1909. Date claimed under International Convention, Aug. 1, 1908.

This invention relates to the manufacture of refractory filaments for incandescent gas-lamps, of the kind in which oxides of thorium and cerium are employed in the mixture of the oxides that is intended to constitute the filament.

The patentee remarks: Hitherto these oxides of thorium and cerium derived from their rare earths have been employed in the powdered form; but it has been found that, when employed in such a form, they do not adhere sufficiently together, so that the resulting filament does not possess the desired strength and durability in use. It has hitherto been proposed to manufacture porous incandescent baskets by impregnating some organic substance having cellular structure—such as cotton—with solution of a salt of refractory earth, incinerating it at as low a temperature as possible, and reducing it to powder, mixing the powder thus obtained with an organic agglutinating substance impregnated with solution of salt of refractory earth in order to form a paste, heating the baskets formed from the filaments obtained from the paste, so as to carbonize the organic ingredients, and then baking them at a high temperature in an oxidizing medium or flame so that the carbon is burnt off.

According to the present invention, the oxides of thorium and cerium employed in the manufacture of filaments of the kind first above referred to are used in the state of a powder, having a fibrous texture, and obtained by first immersing cotton or the like in solutions of thorium and cerium salts and then burning this impregnated product, after drying, at such a high temperature that the carbon of the treated cotton is consumed by the oxygen of the air, and the salts of thorium and cerium are converted into oxides. The powder particles thus obtained possess minute hooks or projections, which engage effectively with the other substances employed in the manufacture of the filament, thereby rendering the latter much stronger.

The process is carried out by using solutions of nitrate of thorium and nitrate of cerium, and immersing the cotton therein. The cotton is thereby impregnated, and when dried it constitutes a sort of gun-cotton, which is then burned in the presence of air. The oxygen of the air consumes the carbon of the treated cotton and converts the nitrate into oxide, which remains over as a residue. This oxide, however, retains the fibrous form of the cotton; and this fibrous form remains also after the filament is ignited.

Instead of cotton, the waste of mantles possessing a similar texture may also be used for this purpose.

MISCELLANEOUS NEWS.

AMMAN VALLEY GAS-WORKS PURCHASE.

The Arbitration Proceedings.

Arbitration proceedings were commenced before Mr. CHARLES CARPENTER, at the Surveyors' Institution, on the 28th ult., between the Amman Valley Gaslight and Coke Company and the Ammanford Gas Company with respect to the purchase by the latter of the undertaking of the Amman Valley Company.

Mr. EDWARD MORTON appeared for the Amman Valley Company; and Mr. F. N. KEEN represented the Ammanford Company.

Mr. MORTON, in opening, said that many of the differences had been agreed with regard to the structural value of certain properties, and, in fact, they were agreed on everything but the buildings and mains. There had been considerable correspondence between Mr. Broadberry and Mr. Stevenson, most of which was read. The total amount of the claim was for £5365.

Mr. *A. E. Broadberry*, on behalf of the claimant Company, said the retort-house was a substantial building, and its value at least 2¼d. per cubic foot. For the 6-inch pipes, he said that 7s. 6d. a yard was the usual price. He was afterwards told that these pipes were second-hand; and he therefore reduced his figure from 7s. 6d. to 6s. For the 3-inch pipes, 4s. a yard was the customary price, which he considered a fair value. With regard to the Yarrow pipes, when he first heard the system of joining explained to him it did not strike him as being good; but subsequently he altered his opinion. He now thought the principle was quite good. If he were responsible for carrying on the works he would not think of scrapping the pipes, because he thought the pitch which had been used could be removed at a cost of about 4s. per joint—amounting in all to about £200.

In reply to Mr. KEEN, witness said that the correspondence which had taken place between himself and Mr. Stevenson had been in order to deal with structural valuation only, and so as to save the time of the Arbitrator. In this particular case, the award should be on the basis of structural valuation for the detailed properties rather than on the valuation of the undertaking as a whole, because no gas had been supplied. It was therefore impossible to estimate the value of the works and plant as a going concern or the profits.

Mr. KEEN: Would it be possible for the purchaser to give a supply of gas by means of the property as it stood on the date the transfer took place—Aug. 16, 1909?

Witness: There were certain finishing touches to be put on both plant and mains.

Mr. KEEN: Taking the whole of the works together, could they be run so as to yield a profit?

Mr. MORTON: We have nothing to do with that.

Witness said he thought the works could be carried on at a profit—certainly, when the faults had been corrected. It all depended, however, on the price at which gas was sold, and the extent of the demand. There was nothing in the nature of goodwill in the claim, because this point had been agreed between him and Mr. Stevenson. He thought that possibly the goodwill counterbalanced the badwill. He valued the works in accordance with the Act of Parliament, which required that they were to be taken over by the statutory Company at a valuation. The limited Company could not carry on the work at all, because the Local Authority had taken proceedings against them with regard to the breaking up of the streets. He certainly thought the undertaking as a whole had a value, and that valne lay in the fact that the statutory Company were ordered to take it over at a valuation. Apart from this, there would be little value in the works. He agreed that the figures for a certain period of carbonizing showed a bad condition of the plant or bad working. He thought they began to make gas before the works were in proper order. With regard to the Yarrow joints, he said he would have been inclined to join them with pitch or cement, but he thought lead would make a very fine joint. The pitch at present in the joints could easily be got away by heating. If a certain amount of the pitch still adhered, it would not interfere with the lead filling. It was a common practice to pour lead on to a pitch-covered surface; but this was certainly more in the case of water joints than gas joints.

Mr. KEEN, in addressing the Arbitrator on behalf of the Ammanford Company, drew attention to the Act of Parliament, which provided that the price to be paid was to be ascertained only by arbitration, and by one Arbitrator to be appointed by the Board of Trade, which was altogether unusual. The make of gas per ton was very small; and there was considerable loss. It was perfectly clear on the figures that there could be very little advantage in the property, and it would seem that the purchasers would be better off in laying down works of their own.

Mr. *W. N. Jones*, the Chairman of the Ammanford Company, said that for a short time he was also a Director of the limited Company. Practically the whole of the plant was purchased second hand. No gas was ever supplied by the Company; and proceedings were taken by the Urban Council to prevent the breaking-up of streets. At about the time when the Act was passed, an electric light undertaking was started in Ammanford. The works of the Amman Valley Company were in a disgraceful state.

Mr. *Hubert Russell*, the Manager of the Ammanford Company, said the works were in a very bad condition. The gas-engine was thoroughly rusted. Several portions of the brickwork supporting the retorts had fallen into the combustion chamber; and it was useless. The leakage on a particular occasion was at the rate of 135 cubic feet per hour. When the Ammanford Company took over the works, they were in such a condition that it was impossible to supply gas—"every bolt and nut was leaking."

When the hearing was resumed on the following day, evidence was given by

Mr. *E. H. Stevenson* on behalf of the Ammanford Company. He said he had inspected the works and the district of the limited Company. He found a great many leakages in the apparatus; and it was impossible for the Company to make anything like the proper quantity of gas per ton of coal. In all his experience, he had never known works thrown together in such a way. The make of gas worked out at 4800 cubic feet per ton; whereas the production ought to have been 9000 feet without an exhauster, and 10,500 feet with an exhauster. The coke made had to be consumed in the furnaces—there was none for sale. As to the structural valuation, he had agreed with Mr. Broadberry on several items; but that was with regard to structural valuation alone. There were no negotiations as to the valuation as a whole, nor as to the principle of valuation. His principle of valuation had always been, under the Lands Clauses Act, the value to the seller. It had nothing to do with the value to the purchaser. With non-statutory companies, and sometimes with statutory concerns, it was usual to prepare a structural valuation. Since he agreed certain figures with Mr. Broadberry, he had again inspected the works, and was of opinion that some of the figures should be reduced. Some of the plant was now absolutely useless, and the using of it would involve much loss of money. He thought the fair value of the mains was £678. In his opinion, the Yarrow joint was not, in itself, a good one. In these particular circumstances, it would be impossible to extract from the joints anything like the full quantity of pitch which had been run in. Even by lighting a fire under every joint, he very much doubted whether the greater quantity of the pitch could be made fluid enough to cause it to run out; and to light such fires under the joints would be a most dangerous experiment to try. If it were possible to run out the greater quantity of the pitch, the whole of the joint inside would be thickly coated with pitch, and there would be some solid pitch at the bottom of the joint. Whatever these pipes might have been in the first instance, it was a practical impossibility to make good joints of them now. They ought to be taken up. He had therefore treated them at their scrap value—20s. per ton. The total structural value of the works was £3283, since they began to supply gas. But he had always been of opinion that there were other factors to be taken into consideration. They had to consider whether it was possible to manufacture gas, and whether the Company's dealings with the people in the neighbourhood were satisfactory. If their relations were good, there might be much more than the structural value in the undertaking; if they were bad, there would be less than the structural value. The undertaking was a thing quite different from the structure. In this particular case, the drawbacks dominated the benefits. In the absence of powers to break up the streets, the possibility was strongly against the limited Company being able to operate the works. The only thing which they could have sold were the meters and stoves in the houses, and the stock-in-trade and tools. It would not pay anyone to take up the pipes.

Mr. KEEN: Taking the undertaking as a whole, with all its benefits and all its drawbacks, at the date of the transfer what was its value?

Witness: I am perfectly convinced that anyone would not have given more than £1000 for it; and in paying this sum, there would have been considerable risk.

Replying to the ARBITRATOR, witness said he objected to the use of the Yarrow pipes in a mining district of this kind, because of the way in which they were jointed. He would never use them himself under these conditions. They were too rigid; it was not at all an elastic joint. He also thought it would be an improper joint if used with lead in a mining district. The only way out of the difficulty in this case would be to take the pipes up and relay them properly; but the cost of doing this would be very nearly as much as the cost of having entirely new pipes laid down.

Mr. MORTON, in addressing the Arbitrator on behalf of the claimant Company, remarked that their Bill went through Parliament without opposition from the limited Company. Then the question was raised of structural value. According to the Gas-Works Clauses Act, "the undertaking" meant "the gas-works and the works connected therewith." The whole of the correspondence indicated that Mr. Stevenson and Mr. Broadberry were to agree as far as they could, and that where they could not agree, the matter should be left to the Arbitrator.

STOCKPORT GAS PROFITS AND THE RATES.

At the Meeting of the Stockport Town Council at which the "budget" was presented, some discussion took place with regard to the allocation of gas profits in aid of the rates.

Alderman Bell, the Chairman of the Finance Committee, submitting the estimates, said he was glad to find that, though they were short of electricity profits, the Gas Committee had been able to increase the amount they contributed in relief of the rates; and instead of £15,000 as last year, they would contribute this year £18,000. This contribution would allow the Corporation to maintain the rates at 6s. in the pound.

This statement was greeted with applause; but nevertheless one or two members urged the adoption of a different policy—namely, that of reducing the price of gas. Alderman Lees expressed the opinion that the price of gas to the consumer should be reduced. The gas was, he said, not so good, and did not cost so much to make, as in former years. He understood the profits were £22,000 after appropriating £10,000 to the sinking fund. He agreed with the policy of maintaining the sinking fund; and he believed the gas-works now stood on the books at half the actual value. But the profits amounted to about 10 per cent.; and this he thought was too much for the consumers to pay. It was not right that the large consumers should have to pay so much, and that those who did not consume gas should share in the profits. It was very important that the rates should be kept down, in order to bring industries to the town; but high charges for gas were a deterrent in this latter respect. Mr. Brewster also thought consumers should benefit, through a reduction in price. He pointed out that those who were not consumers were benefiting to the extent of a shilling in the pound at the expense of the consumers.

The Chairman of the Gas Committee (Mr. James Fernley) said that once more he would reply to the question of the reduction of the price of gas—a question which had been brought up by some people each year, and which he had had the pleasure of replying to for three or

four years. He knew Mr. Brewster was very strong on the matter; but he was in a great minority on the Gas Committee. The money which the Gas Committee made was at the disposal of the Council; and it was immaterial to the members of the Committee whether the price of gas was reduced or whether they made a contribution towards the reduction of the rates. Many members of the Committee certainly thought that money given to the relief of the rates was better spent than in the reduction of the price of gas. It could not be said they charged an excessive price for the gas, otherwise there would probably be justification for the outcry. Their price was 1s. 3d. to 2s. 4d. per 1000 cubic feet. That at Birkenhead was 1s. 9d. to 2s. 6d.; Birmingham, 1s. 6d. to 2s. 4d.; Manchester, 1s. 9d. to 2s. 4d.; Ashton, 2s. 4d.; Bollington, 2s. 4d.; Macclesfield, 2s. 3d. to 2s. 6d.; Runcorn, 2s. 4d. to 3s. 2d.; Warrington, 1s. 6d. to 3s. 4d.; and Middleton, 1s. 3d. to 3s. 3d.

Alderman Bell, replying to the discussion, remarked that it was not the first time they had been told in the Council that the profits had now assumed such a figure that it was time the price of gas should be reduced. They must consider the amount of capital which they had invested in the gas-works. The works had cost from their inception in capital expenditure over £453,000; and the present capital was £258,000. They must look at the gas-works as a commercial undertaking. Capital was invested, and capital must give a certain return to the shareholders, who were the ratepayers of Stockport. On the present capital of the gas-works, the £18,000 profit was only equal to about 7 per cent.—not a big profit for such a large undertaking.

GAS PROFITS AND THE RATES AT BELFAST.

At a Special Meeting of the Belfast Borough Council, Mr. J. A. Doran, the Chairman of the Gas Committee, said a deputation from the Finance Committee came before his Committee to ask for a grant of £15,000 from the gas profits. The Gas Committee thought it was time to come to a halt in this matter; but the deputation made such strong representations to them that they decided it would be wise to give something like £12,000 towards the reduction of the rates. They were told that if they did not give a grant, the rates would have to be increased by 3d. or 4d. in the pound; and they certainly considered they were high enough at present. The Gas Committee had given about £24,000 altogether during the year. They were still paying the sinking fund on the City Hall, which amounted to something like £12,000 per annum, so that the building was not costing the public a penny. He thought, however, it was really time something should be done to face the question boldly; and he would advise the various Committees who were always looking to the Gas Committee for assistance to be more careful in the future.

Mr. M'Cusker moved that the proposed grant be referred back to the Committee. It would be argued that the gas-works belonged to the ratepayers; but if they were not paying, would the ratepayers be asked to make up the difference? He maintained that the consumers of gas would have to do so; and it was not fair that the profits of the concern should go towards paying the rates of other people. They had 24,000 odd prepayment meters, mainly used by the working classes. Why should some consideration not be given to these people, so that they might be supplied with gas as cheaply as possible? Then they had 44,000 ordinary consumers, and no consideration was shown to them. Neither the Tramways Committee nor the Market Committee proposed to devote any profits to the relief of the rates; and he did not see why the Gas Committee should adopt that course.

The amendment was defeated; and the proposal to hand over the sum named was agreed to.

GAS PROFITS AND RATE RELIEF AT WEST BROMWICH.

At the Meeting of the West Bromwich Town Council last Wednesday, the Chairman of the Gas Committee (Alderman Wilson) proposed that £1000 should be allocated out of the profits of the gas undertaking for the past twelve months in relief of the rates of the borough for the coming year. He said the Committee had very reluctantly come to the conclusion to hand over £1000, because recent legislation would probably cause an increase in the price of coal; and he was afraid that, by taking £1000 out of the profits, they would be running the thing very close. Considering, however, that an effort should be made to help the rates, the Committee asked the Council to accept the grant. Having regard to the keen competition the gas undertaking had to contend with, and the diminished sales of gas, he at first voted against the grant; and he now supported it with very great reluctance. He thought they should husband the resources of the gas undertaking a little longer. Alderman Salter said everybody sympathized with the Chairman of the Gas Committee in his present position. Some eight or nine years ago, a resolution was passed by the Council with the idea of strengthening the gas undertaking by preventing the grant of sums of money annually out of the profits in relief of the rates. But every year since the Council had suspended the resolution; and the rates had benefited. In view of what the Chairman of the Gas Committee had stated, the position of affairs should be taken into serious consideration, and the expenditure of the Council kept down, so that another year there would be no necessity to ask for help from the Gas Department. Mr. W. Lawley pointed out that there had been a great decrease in the consumption of gas in the borough owing to changes going on. Still, he was hoping the gas undertaking would survive all competitors, and that gas would regain the position it formerly held in the town, when they were able to show an increase every year. He did not know that they need be particularly downcast about the outlook. Mr. J. Lawley thought they must not take too gloomy a view of the position of the gas undertaking. The Mayor (Mr. J. Brockhouse) said that he had always been opposed on principle to relieving the rates out of the gas profits; but he did not object to it very strongly this year. The motion was agreed to.

THE STANDARD BURNER QUESTION AT PLYMOUTH.

Correspondence between the Gas Company and the Corporation.

In accordance with a suggestion made at the special meeting of the Plymouth and Stonehouse Gas Company at which sanction was given to the promotion of the Gas Companies' Standard Burner Bill, communications have passed between the Company and the Plymouth Corporation, who are among the opponents of the measure. Sir Joseph A. Bellamy, the Chairman of the Gas Company, has talked the matter over in an informal way with the Town Clerk, with a view to seeing whether the objections of the Corporation can be met; and more formal steps have been taken in correspondence between Mr. H. B. Heath, the Secretary of the Company, and the Town Clerk. Although it is improbable that the Corporation will withdraw their opposition, the correspondence has had the effect of placing the case for the standard burner clearly before the public. As Mr. Heath points out, an entire misapprehension prevails in the minds of people as to the circumstances which have led to the promotion of the Bill; and the publication of his letter in the local Press has, no doubt, contributed to the enlightenment of the inhabitants of Plymouth.

In his statement of the general reasons for proposing the adoption of the "Metropolitan" No. 2 burner for testing the illuminating power of the gas, Mr. Heath goes over ground familiar to readers of the "JOURNAL." The local application of the facts is not, however, so well known. It appears that the Gas Company were originally under an obligation, by their Act of 1855, to supply gas of only 10-candle power. As a matter of fact, the gas sent out was of about 14-candle quality; and when the Company went to Parliament for further powers in 1879, the standard was raised to this figure. In 1894, on the Company again going to Parliament, the Corporation succeeded in getting the illuminating power increased to 15 candles; but after nine years' experience, this was reduced, on the Company's last appearance in Parliament in 1903, to 14 candles. The Corporation assented to this decrease of a candle; but the Town Clerk now says the illuminating power is greatly complained of, and urges this as a reason why there should be no further reduction of illuminating power, such as would result, he contends, from the substitution of the proposed standard burner for the one now used for testing the gas. Mr. Heath meets this statement with a reference to facts within the Company's knowledge. "Our own records," he says, "show that complaints from gas consumers in our district have enormously decreased during the past few years. The increase in the number of consumers since 1905 has been 16 per cent., while the number of complaints from all causes, as compared with that year, has decreased 60 per cent."

The Town Clerk suggests that, in order to remove the objections to the change in the burner, the Company ought to either increase the standard of the illuminating power or reduce the price of the gas. Dealing with the second of these proposals first, Mr. Heath points out that the standard price in Plymouth is 2s. 6d., and the price at present charged is 1s. 9d. per 1000 cubic feet. Under the sliding-scale, the consumers are the chief gainers from any reduction in the price, as is shown by the fact that out of the sum of £4000, which a reduction of 1d. per 1000 cubic feet represents, the shareholders get £445 and the consumers save £3555 in their gas bills. "Put in another way," remarks Mr. Heath, "the business of this Company, after clearing 5 per cent. on the capital, is being carried on for the benefit of the consumers, who allow our shareholders a bonus of about 10 per cent. on the surplus profits earned for them, the consumers." These being the conditions, it is to the interest of the consumers and the ratepayers that the Corporation should assist the Company in effecting every possible economy. As to the illuminating power of the gas, Mr. Heath points out that the introduction of the incandescent mantle has entirely altered things. There are, of course, still users of flat-flame burners, whose interests would be affected by a lowering of the candle power, while those who have incandescent burners would not. But the gas consumed with flat-flame burners represents only 15 cent. of the total consumption; and at least one-half of these burners might be changed to incandescents with advantage to the consumer, while in many cases a much better light could be obtained by more attention to the burners than is usually given. On the subject of the heating power of gas, Mr. Heath says that a great number of tests have been made at the gas-works during the past two years; and the results prove conclusively that between gas of 14 and gas of 15½ candle power there is no appreciable difference—the variation in the heating power not reaching 1 per cent. As regards the light and heating power, the Company therefore contend that the consumers will not be prejudiced, while they will benefit by any economy which may result from the adoption of the new test-burner.

HARROGATE CORPORATION AND ELECTRIC LIGHTING.

Proposed Adoption for the Public Lamps.

It appears that the Harrogate Corporation are likely to have under consideration very soon the subject of the public lighting of the town; the Electric Lighting Committee having proposed to the Committee who have control over the street lighting to convert into electric lamps the whole of those at present supplied with gas, which are owned and maintained by the Corporation. The matter was referred to at the annual meeting of the Gas Company on Monday last week, as noticed elsewhere. The Chairman (Mr. F. Barber) said the extension of the rights of the Corporation to supply electricity outside the borough, under the Electric Lighting Act of last year, was a fact which must be considered; but so long as business principles were adhered to in the administration of the undertaking, the Gas Company had nothing to fear. The trouble would arise, he thought, if any attempt were made by unfair means to develop competition in this direction which would be likely to affect the position of the Company as very large ratepayers within the borough. Every attention would be paid to the conduct of the Corporation in this direction. He noticed that there was a proposal

to convert into electric lamps the whole of the lamps at present supplied with gas. It was not possible, from the published accounts of the Corporation, to give the corresponding cost, lamp for lamp, between electricity and gas, without knowing the varying cost of the electric lamps at present used. Taking only the number of gas and electric lamps, it would appear, from the accounts, that while gas cost about £1 4s. per lamp per annum, electricity cost £4 2s. In making this rough calculation, some of the charges against gas might really be charges against electricity. The question was one upon which the public of Harrogate would require to be satisfied. Unless the Electric Lighting Committee could show the ratepayers that their proposed change would result in equal efficiency and economy, he felt sure that it would not be sanctioned. But he knew that no such result could be shown by the Committee; and the Company must therefore have confidence that the representatives of the people would see that no such step was taken to the detriment of the ratepayers. The Company were quite ready to accept any challenge in this matter of public lighting, and, if given equal opportunities with the Electrical Department, he did not hesitate to say that the Company would be able to offer terms for the whole of the public lighting which would enormously reduce the cost at present incurred by the Lighting Department. This matter would not be lost sight of, and every legitimate claim would be put forward on behalf of the Company for fair treatment. Everything that was done in the direction of increased public expenditure, either for street lighting or for any other purpose, only meant increased rates to the people; and the question of their ever-increasing rates was now uppermost in everyone's mind, and was really becoming a most serious matter. During the last ten years, the rates within the borough had increased by no less than 1s. 11d. in the pound, 5d. of which was due to the calls of the County Council.

LECTURES ON AIR PURIFICATION IN GLASGOW.

Readers are aware that the Gas Committee of the Glasgow Corporation some weeks ago arranged for the delivery of a series of lectures having for their object the enlightenment of the public on the subject of the prevention of air pollution by smoke. The first was delivered on the 9th ult. by Mr. A. Wilson, the Gas Engineer of the Corporation, and he was succeeded two days later by Professor J. W. Graham, of Dalton Hall, University of Manchester; both lectures being noticed in the next issue of the "JOURNAL." The following Wednesday, Mr. Walter Grafton, the Assistant Manager, lectured on "The Domestic Uses of Coal Gas;" and an epitome of his discourse has already been published (*ante*, p. 525).

Mr. G. B. Langlands, the Chief of the Public Lighting Department, speaking upon "Gas Appliances and the Problem of Air Purification," described in detail the many appliances for the employment of gas for domestic and trade purposes. He strongly appealed for the more general adoption of gas-fires for the heating of the home, and laid stress upon their convenience and cleanliness. He also commended the life-saving crusade in favour of clean air as an object quite as important as even such splendid movements as the lifeboat work.

Mr. J. M'Ghee, the Superintendent of the Works Department of the Corporation gas undertaking, in a lecture on "Coal Gas and How to Obtain the Best Value from It," described various appliances for the use of gas, and combated a number of objections which are frequently put forward with regard to gas for both lighting and heating.

Mr. W. M. Mason, of the Central Gas Office, dealt with the subject of "Modern Necessities: Gas for Light and Heat." He showed the substitute that might be offered in lieu of what he described as the barbarous method of producing heat by consuming raw coal. His solution was the use of gas for all lighting, heating, and cooking. He said the critics of to-day told them that gas was too dear, as against the price of coal, to be advocated as a means towards air purification. He quoted figures showing the gradual decrease in the price of gas from 1869, when it was 4s. 7d. per 1000 cubic feet, to 1910, when it was 2s.—the lowest price ever recorded in the history of the Glasgow Gas Department. He informed his audience that an interesting census had just been completed showing the growth of incandescent lighting in the Glasgow area of gas supply. In the last five years, the use of incandescent lighting in houses of less than three apartments had increased 215 per cent., in houses of four apartments and upwards 160 per cent., and in shops, warehouses, &c., 188 per cent. Dealing with the very important question of ventilation in connection with public buildings, Mr. Mason referred to a gas-burner which had been evolved in Glasgow which was meeting a felt want in connection with the lighting of large halls, churches, theatres, &c. It was designed to supersede the old style of circular pendant, and had a circle of 28 inverted incandescent burners fitted under a reflector. The main feature of the appliance, which gave an illumination of nearly 2000 candles for a consumption of only about two pennyworth of gas per hour, was that it was fitted with ventilating shafts through which the hot air passed out of the building, carrying with it the products of combustion, and materially helping to keep the hall free from foul air. Various systems of shop lighting were referred to; and interesting statistics were quoted relating to the progress made in Glasgow as regarded street lighting since the first public lamp was lit in the City in the year 1818. Mr. Mason said there were now upwards of 22,000 lamps, lighting 320 miles of street, on the incandescent gas system. The second part of Mr. Mason's lecture was devoted to the subject of heating by gas, and the great convenience of the gas-fire. The usual questions asked about this style of heating—"Is it healthy?" and "Is it economical?"—were answered with an emphatic "Yes;" and the lecturer supported his affirmation by quotations from leading authorities. Cooking by gas was also dealt with, and the immense improvements which have been made in appliances since they were first put on the market in 1850 were shown. It was estimated there were now considerably over 2 million gas-cookers in use in the United Kingdom, which meant that more than one-fifth of the inhabitants of the British Isles were fed with gas-cooked food. The lecturer referred to the new washhouse boiler, which, at the cost of about 1d. for gas, could bring 12 gallons of water to boil within an hour.

AUSTRALIAN GASLIGHT COMPANY.

Gas Supply during the Coal Strike.

The Half-Yearly Meeting of this Company was held at the Head Office, No. 163, Kent Street, Sydney, on the 27th of January, under the presidency of Mr. G. J. COHEN, the Chairman.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was presented. They stated that the profits for the six months ended Dec. 31 last, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, with the balance brought forward, amounted to £71,663; and they recommended the payment of a dividend for the six months of 9s. per share on the old shares, and in proportion on the new ones, free of income-tax. This would absorb, in round figures, £60,000, and leave a balance of £11,663 to be carried forward. The Directors stated that the coal strike was causing the Company much anxiety. The supply of gas was being maintained, but at a serious extra expenditure for coal, shale, and oil, which would have to be provided for during the current half year. The Engineer (Mr. Thomas J. Bush) reported that the whole of the Company's plant had been efficiently maintained.

The CHAIRMAN, in moving the adoption of the report, said the steady increase in the consumption of gas which had been reported for some time past had been considerably augmented, particularly during the month of December, owing to the coal strike at Newcastle. Under ordinary circumstances, the Directors would gladly have welcomed such an increased demand, but could hardly do so under existing conditions, as it was costing so much more to make gas than the price charged; indeed, if they doubled the rate it would not recoup them for the enormous outlay incurred. But they had all through considered that they were in duty bound to do their utmost to keep up the supply of gas at any cost, rather than that the city and suburbs should be in darkness, and the consumers inconvenienced thereby—so many of them depending upon gas for both domestic and manufacturing purposes; and he was satisfied that the general public would value the success of the Directors' efforts on their behalf. The Company were able to hold out for more than six weeks before having to consider seriously the purchase of coal at the high rates ruling. When, however, it became necessary to secure supplies at the enhanced prices, the Board did not hesitate to incur the extra heavy expenditure, which had not ended. In this connection, he wished to acknowledge the valuable help rendered to the Company by the Chief Railway Commissioner in meeting the Directors in the matter of railway haulage at a time when such assistance was of the utmost importance. The action of the miners in ceasing work without notice had done serious injury to companies like theirs who served the public, and upon whom so many thousands depended. The past half year had not suffered to any great extent, as the major part of the additional expenditure for coal, shale, and oil, would have to be included in the current six months. The consumers had certainly not assisted the Company in the crisis; for, instead of being economical in the use of gas, they had in many cases reserved their stocks of coal, or refrained from replenishing them, and had used gas exclusively—thus making it all the harder for the Company; stocks of coal being small, and the cost of production so much heavier. However, he was pleased to state that there had been no curtailment in the gas supply throughout the city and suburbs, other than a slight diminution in the hours of lighting the public lamps, which had been partly restored. So that practically the only inconvenience the public were being subjected to was in the matter of extensions; the Board considering that, in the interests of the present consumers, they were justified in suspending all new work. The Balmain Municipal Council terminated their lighting agreement with the Company in September last; and Newtown and Annandale had intimated their intention to do so at the end of the present year. He understood that special inducements had been held out to these Councils with a view to the adoption of electric lighting for the public streets; but he could only again repeat what he had said on previous occasions, that, taking light for light, gas was the cheaper illuminant. Referring again to the Company's operations for the past half year, the quantity of gas sold was 1,293,286,000 cubic feet; showing an increase of 87,211,000 cubic feet, or 6·7 per cent., when compared with twelve months ago. The number of lamps in use was 11,026; and the gas-cookers sold by the Company during the half year amounted to 824—the total sold to date being 19,699. The consumers numbered 90,238, or an increase of 1591 for the six months. The additional mains and services laid were equal to 43 miles; the total length now being 2419 miles. In conclusion, he might say that the general outlook for gas was still very satisfactory. The popularity of the inverted incandescent gas-burner was well maintained, and nowhere more so than in Sydney. It had already been the means of inducing many to revert to gas after a trial of the electric light; it being found less expensive to use, while the illumination afforded by it was superior, and less trying to the eyesight.

The DEPUTY-CHAIRMAN (Mr. J. H. Storey), seconded the motion, and it was unanimously adopted.

A hearty vote of thanks was passed to the Directors and officers for their services during the past half year.

Barking Gas Company.—At the half-yearly meeting of this Company last Wednesday, the accounts presented showed that the revenue in the six months ended Dec. 31 was £16,634, and the expenditure £11,013; leaving £5621 to go to the profit and loss account. The balance available for distribution was £8042; and the Directors recommended the payment of the full statutory dividends on all classes of shares, as well as £300 on account of back-dividends on the original shares (all less income-tax). This absorbed £3910, and left £4132 to be carried forward. The Directors reported that the business of the Company was progressing satisfactorily; the sales of gas for the six months showing an increase of 11·5 per cent. over those in the corresponding half of 1908, while 412 additional consumers came upon the books.

HARROW AND STANMORE GAS COMPANY.

A Satisfactory Report.

The Ordinary Half-Yearly Meeting of this Company was held at the Holborn Restaurant last Friday—Mr. A. H. BAYNES, J.P., in the chair.

Mr. W. CADY read the notice convening the meeting; and the report and accounts were taken as read. The former stated that the business of the Company continued to prosper; but the heavy fall in the value of coke had adversely affected the revenue for the half year to Dec. 31. The Directors, in conjunction with other gas companies, were promoting a Bill in Parliament to alter the present standard burners as fixed by the different Acts to one standard burner of later date, which was now in statutory use in many companies, and was in accordance with the Model Bill of the Houses of Parliament. A resolution to approve the contents of this Bill would be laid before the proprietors at a special general meeting. The balance of profit and loss account was £9720; and the Directors recommended the declaration of dividends for the half year at the rate of 10½ per cent. per annum on the original "A" capital, £7 7s. per cent. per annum on the additional "C" capital, and 7 per cent. per annum on the additional "B" capital and guaranteed shares—all less income-tax. This would leave £4570 to be carried forward to the next half year.

The CHAIRMAN, on rising, said it was with sincere regret that he had to report the absence from the meeting of Mr. Horace J. Rydon, J.P., one of the Directors, who for many weeks past had been suffering from grave illness, from which he was only slowly recovering. Then a few days ago their Engineer and Secretary, Mr. J. L. Chapman, had the misfortune to contract a very severe form of influenza, and was by medical orders confined to his room. He felt sure the shareholders would join with the Board in expressing their sympathy with these gentlemen, and in hoping that they would both make a speedy recovery. Proceeding to move the adoption of the report and accounts, he remarked that it would not be needful to detain the shareholders by any lengthened statement. It must be satisfactory to them to know that during the half year just closed there had been an increase of nearly 10 per cent. in the sale of gas, as compared with the corresponding period of 1908. A very considerable amount of difficulty during a portion of the six months had arisen from the fact that the Middlesex County Council had been putting down tramway lines in the parish of Wembley. The works now in progress seriously interfered with the comfort of the population, as the whole of the road was broken up and the traffic displaced—the roads and paths being in a very unsatisfactory condition. As a consequence, many houses were at present unlet. But as soon as the works were completed, and the tramways were in operation, there was every prospect of a very considerable increase in the number of consumers and new residents. It was also somewhat unfortunate that the London and North-Western Railway Company had just now several bridges under alteration, and highways were being widened and diverted—this work greatly interfering with the letting of houses. As soon, however, as the short electric line was completed, there would be two new stations opened, and a continuous service of trains, passing through pleasant country districts, which would also, without doubt, bring new residents, and further customers to the Company. The Harrow Metropolitan station had lately been enlarged and improved, and the number of trains increased; and this, too, was proving beneficial to their undertaking. The Engineer was at present proceeding with the erection of the new gasholder, which was to hold about 1¼ million cubic feet of gas. The tank had been completed; and the gasholder Contractors, Messrs. Cutler and Sons, were under agreement to finish their work by Aug. 1 next, as it would be necessary, on account of the continued increase in the sale of gas, to be fully equipped with this additional holder before the autumn set in. Satisfactory arrangements had also been made to secure a junction line from the gas-works to the Metropolitan Railway. This, it was anticipated, would be completed by Oct. 1, when all the traffic, amounting to nearly 18,000 tons annually, would pass direct to and from the works by rail. All materials—including coal, coke, and other goods—had at present to be carted to and from the Harrow Metropolitan Station, which was about 1¼ miles from the works. The Directors confidently expected there would be a very considerable saving when the new gasholder and the railway connection were brought into working order, and the heavy cost of cartage saved. The past half-year's results did not show quite so large an increase in the profits. This was partly due to the lower price obtainable for coke in the Company's district—large quantities being brought in at low prices from works outside their area—and partly to the writing-off of a considerable length of old main-pipes which had been cut out—larger ones having been laid in their place. The Directors deemed it wise to incur this latter somewhat heavy expenditure at the same time as the operations for the laying down of the tramway lines were in progress. The results per ton of coal and per gallon of oil were about the same as they had been for the last two or three years; and the unaccounted-for gas for the whole twelve months now stood at 5½ per cent. The net profit for the half year was £6230; while the dividends recommended and the interest on the debenture stock would require £6004, which would leave a balance of £226 to be added to the sum of £4344 brought forward; making a total of £4570 to be carried to the next account. The Board felt that it ought to be pointed out to the shareholders that the past half year had been a specially onerous one for Mr. Chapman; the alteration, extension, and improvement of the works having involved a large amount of care, anxiety, and time. They were convinced that the shareholders would join with them in a special assurance of hearty appreciation of the Engineer's untiring and thoroughly successful efforts to make the works of the Company second to none. The Directors confidently anticipated that, as the result of the special expenditure on the works during the past half year, there would be a very considerable increase in the business of the undertaking during the current six months.

The DEPUTY-CHAIRMAN (Dr. J. W. Lee Glaisher) seconded the motion; and it was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Dr. GLAISHER, the dividends recommended were declared.

Subsequently, on the motion of Mr. A. F. PHILLIPS, J.P., seconded by Dr. GLAISHER, the retiring Director (Mr. Baynes) was re-elected; and the retiring Auditor (Dr. C. E. Goddard) was also re-appointed, on the motion of Mr. F. LENNARD, seconded by Mr. F. H. PILLEY.

Mr. PHILLIPS said they were all exceedingly sorry that the Engineer was not with them; but he was sure Mr. Chapman himself was quite as sorry to be absent. The shareholders had heard of the excellent services he had continued to render the Company; and these services became the more onerous in consequence of the alterations and additions that had continually to be made to the works to meet the increase in consumption. They were much indebted to him and to the staff for the accounts presented that day; and he had much pleasure in proposing a vote of thanks to Mr. Chapman and those under him.

This was cordially agreed to; and the Chairman and Directors were also thanked for their services, on the motion of Mr. F. R. SMITH, seconded by Mr. LENNARD.

The Standard Burner Bill.

A Special Meeting was then held for the purpose of considering the Standard Burner Bill, in the promotion of which the Company are joining.

The CHAIRMAN said the object the gas companies had in promoting the Standard Burner Bill was to secure uniformity in the testing of their gas. The burner at present used in testing the Company's gas was prescribed in their original Act of 1873, and was the burner generally used throughout the country at that time. It would give fairly consistent results when testing plain coal gas of a uniform specific gravity and a quality of 16 candles. Owing, however, to the difficulty of obtaining cannel and its increased cost during the last fifteen years, most gas companies had adopted oil as a means of enrichment, in conjunction with water gas. Such gas had a higher specific gravity, and required less air for its combustion—that was to say, that the same quantity of light was obtained from a smaller flame—and, consequently, in order to secure uniform results, it was necessary to have a burner to which the air supply for the combustion of this gas could be adjusted. These facts had been recognized for some years, and formed the subject of an inquiry by a Departmental Committee, who reported to the Board of Trade the advisability of the substitution of the No. 2 argand for the old No. 1. Since that report in 1905, this had been the burner named in the Model Gas Bill; and it had been introduced into all the Acts of Parliament which had been passed subsequent to that date. The gas supplied by all the London Companies and about sixty other companies in the Provinces, as well as by sixteen local authorities, was now tested by the No. 2 burner. The gas companies had no desire to take any advantage of their consumers; but it surely was unreasonable to put the companies to the expense of supplying an article from which the consumer obtained no benefit. If the introduction of the new burner was the means of reducing the cost of gas, the price would be lowered; and for every penny reduction, the consumers would have the benefit of £750, while the shareholders would only receive £230. The Bill which had been deposited in Parliament had no other object. But for some reason, advantage had been taken of it by many local authorities to get up extraordinary opposition; and they had deposited petitions requesting the introduction into the companies' various Acts of clauses quite foreign to the intention of the Bill, and to which the companies would certainly not agree. He ventured to think that the shareholders in the Harrow Company would at once say that it was to their interest to support the Bill; and he therefore begged to move—

That this meeting having considered the Bill now pending in Parliament, intituled "A Bill to provide in the case of certain gas companies for the adoption of the 'Metropolitan' argand burner No. 2 as a standard burner, in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them and for other purposes," hereby approves the same, subject to such additions, alterations, and amendments as Parliament may see fit to make therein.

The resolution was unanimously passed without discussion; and this brought the proceedings to a close.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

Increased Business in Both Departments.

The Ordinary General Meeting of this Company was held on the 22nd ult., at the Offices, No. 50, Cannon Street, E.C.—Mr. JOSEPH MANWARING in the chair.

The SECRETARY (Mr. W. A. Schultz, F.C.A., J.P.) read the notice convening the meeting and the minutes of the previous meeting; and the report and accounts were taken as read. These showed, for the year ended Dec. 31, a profit on the gas account of £4722, and on the electricity account of £374. After providing for every charge against the year's working, and interest on the mortgage debenture stock, and the payment of an interim dividend at the rate of 5 per cent. per annum for the half year ending June 30, and setting aside a sum of £225 for reserve for renewal of plant, there remained a balance of £2284 at the credit of profit and loss account, out of which the Directors recommended the payment of a dividend at the rate of 6 per cent. per annum for the six months to Dec. 31, making 11½ per cent. for the year, and leaving £102 to be carried forward. The demand for gas and electricity continued to progress satisfactorily.

The CHAIRMAN, before referring to the business of the Company, made feeling allusion to the loss which had been sustained by the death, last May, of Mr. Frederick Bridges, who, besides being one of the earliest shareholders in the undertaking, had since 1902 occupied a seat on the Board. The Directors felt that, to fill up the vacancy created, they could not do better than invite Mr. Samuel Spencer (who had been for many years connected with the gas industry, and was a shareholder in the Company of many years' standing) to join the Board; and the shareholders would later on be asked to confirm this appointment. Turning to the report, he remarked that the Board were that day presenting to the proprietors for their approval accounts which he thought he was fairly justified in describing as most satisfactory; and he was glad that the action of the Directors (supported by the share-

holders) in embarking upon the scheme of adding the production of electricity to that of gas, had met with a considerable amount of success. It was impossible to foresee at the commencement exactly in which direction the greatest consumption for electric energy would eventually be manifested; and consequently various mains had to be laid into the districts in which such demand might have been expected. There had, however, been an exceptional demand in the immediate neighbourhood of Sunningdale at the extremity of the main which was laid the previous year—so much so, that it was found necessary before last Christmas to lay down another main from the works to Sunningdale. This work was carried out, and consumers in the neighbourhood were obtaining a satisfactory supply. It would be noticed from the accounts that the sale of electric current had more than doubled itself in the past year, as compared with the figure for the previous twelve months. Applications were still coming in; and the revenue was steadily increasing at a very satisfactory rate. The profit from electricity was shown at £374, as against £32 for the preceding year; but it must be borne in mind that those charges which were common to both gas and electricity had to be allocated under the Act considerably to the disadvantage (for the time being) of the Electrical Department. Otherwise a larger profit would be shown in this respect. It might have been expected that, with the advent of electricity, the gas output would have suffered; but the Directors were pleased to be able to say that, not only had the output of gas not diminished, but it had actually increased to the extent of 1,150,000 cubic feet. On the other hand, the revenue charges had decreased by the amount of £266, leaving the profit on the gas undertaking £288 more than was that of the previous twelve months. The Directors thought it wise at the close of the June half year to be cautious; and they consequently declared an interim dividend at the rate of only 5 per cent. per annum for the six months. There was, however, sufficient profit to enable them to recommend that 6 per cent. be paid for the second half year, making the dividend 5½ per cent. for the year, and thus maintaining the dividends at what they have been since 1905. The capital expenditure on the gas account had been £1871, and on the electricity account £3500. The Directors did not anticipate that there would be much further need of capital outlay, except in regard to the retort-house accommodation, and any necessary extensions where an increased supply might be demanded. The siding from the London and South-Western Railway on to the works had recently been extended. Further shares had been offered to the public during the past year, and also some 4½ per cent. perpetual mortgage debentures, producing a slight premium. The Board proposed to issue shortly after Easter sufficient capital to enable them to clear off the present bank loan and overdraft, and to provide enough money for any necessary extensions. There was no desire on the part of the Directors to shut their eyes to the fact that the present prosperous state of the Company could not have been possible without the loyal and hearty co-operation of the Engineer (Mr. A. E. Brooks) and the Secretary. The Board had recognized this by advancing the salary of the Engineer from Jan. 1 last. They were indebted to Mr. Schultz to a great extent for the successful initiation and carrying through of the electric lighting scheme, whereby the Company had been enabled to maintain the profits of the Gas Department unimpaired. He concluded by moving the adoption of the report and accounts.

Mr. H. W. SMITH seconded the motion; remarking that the report was very good—indeed, almost better than they might have expected. When electricity was introduced as a part of the business, he was rather opposed to the scheme, because he feared that it would somewhat cut into the profits of the Gas Department. The accounts now before them proved, however, that the electrical business had been more of an advantage to them than otherwise.

The resolution was then carried unanimously.

On the proposition of Mr. H. C. WALKER, seconded by Mr. H. W. SMITH, a dividend for the half year at the rate of 6 per cent. per annum, less income-tax, was declared.

Mr. F. R. SMITH moved the confirmation of the appointment of Mr. Samuel Spencer as a Director, in place of the late Mr. Frederick Bridges, and also his re-election. Mr. Spencer, he said, had had so long an experience of gas affairs, that the Company were extremely fortunate in having him on the Board.

Mr. H. W. SMITH, in seconding, remarked that Mr. Spencer was associated with a good many companies, and probably there was scarcely anyone who knew more of the ramifications of a gas undertaking than he did.

Mr. SPENCER, in returning thanks, said he had recently visited the works, which he had never done before, although he had been a shareholder since the inception of the Company. He found the works capable of meeting all requirements; and he was delighted with them. The electrical portion was equal to anything that would be needed for a long time, except perhaps some trifling additions. The only thing he regretted was to see the neighbourhood so sparsely populated; but no doubt even this would right itself in time. Originally, he was somewhat against the taking up of electricity; but there was no doubt that in the future they would derive a great amount of benefit from it, because their possession of both gas and electricity would prevent opposition. It was gratifying to see that, in the second year of working the electrical plant, the receipts from the sale of current were two-and-a-half times as much as in the first year; while the profit was ten times greater. They could not expect this rate of increase to be continued; but he felt that the figures would go on satisfactorily growing until they had secured all the likely customers. Altogether he looked forward to a prosperous future for the Company.

The Auditors (Messrs. T. W. Welton, F.C.A., and Dr. H. J. Strong, J.P.) having been re-appointed,

A vote of thanks to the Chairman and Directors was accorded on the motion of Mr. WALKER, seconded by Mr. C. COMINS, and was duly acknowledged by the CHAIRMAN.

Similar recognition having been made of the services of the officers and employees, on the proposition of Mr. COMINS, seconded by Mr. F. R. SMITH,

Mr. SCHULTZ returned thanks. He said the Chairman had referred to the loyalty with which the Engineer and Manager, Mr. Brooks, had served the Company during the past year—and, in fact, ever since he had been appointed.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week at the Holborn Restaurant—Mr. ALFRED H. BAYNES in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, briefly touched upon some of the features of the working of the half year. He said it would be seen that only £978 had been expended on gas capital account; and this had been entirely for new mains and services. Turning to the gas revenue account, it would be noticed that private lighting had brought in about £1000 more than in the corresponding period of last year. The increased consumption was due to a better supply having been afforded to the outlying districts, and to the active policy that had been pursued in the gas-fittings and show-room department. The Company had not only been authorized to supply gas, but they had been entrusted by Parliament with power to supply fittings and apparatus necessary to consumers for obtaining the best results in lighting, heating, and cooking. Until recently these powers had been undeveloped. But the Directors found that the consumers were not obtaining the best results; and to prove the suitability of gas for all purposes connected with domestic and trade supplies, expert men had been engaged to advise consumers, and to execute the necessary fittings, with (he was glad to say) very pleasing results. During the half year, the Company had supplied, excluding cookers, more than 1000 gas-fires, burners, pendants, &c., giving the consumers the best value for money, as well as developing the business. At the present time, they had, practically speaking, no complaints; and those they had had were invariably proved to be due to some local defect, such as an obsolete burner or defective fitting. In convincing consumers that the gas supplied by the Company was of good quality, it was satisfactory to report that they had had the assistance of the East Barnet Valley District Council, who had recently appointed a gas examiner to test the gas; and he had certified the gas free from impurity and of 16·3-candle power, or about 16 per cent. higher in illuminating power than was required by Act of Parliament. The receipts from residuals showed a slight increase, due entirely to the better return from sulphate; and there was a satisfactory increase in the rental of meters, stoves, and fittings. With respect to the expenditure on revenue account, the proprietors would be pleased to notice that coal had cost considerably less in the half year than in the corresponding period of 1908. This was due to two causes: (1) On the advice of their Engineer (Mr. F. J. Bancroft), they had been using a different character of coal which, while yielding a good supply of gas of high illuminating power, had cost the Company less per ton. (2) The regenerative furnaces recently installed, at considerable expense, had fully justified the Directors in pulling down the old retort settings and replacing them with modern ones, and had enabled them to make a greater quantity of gas per ton—the result being that they had sold upwards of 5 million cubic feet of gas more in the half year with a decreased cost for coal of over £600. Early last year, the Engineer made a very favourable contract for coal; but, as the proprietors were no doubt aware, there was now considerable unrest in the coal trade. The Directors therefore thought it advisable to make the contract for next year early; and although they had not been able to obtain as good terms as last year, they had, he thought, done very well considering the labour disturbance. The item of repair and maintenance of works, &c., had been reduced by more than £1000; for it would doubtless be remembered that last year they had considerable outlay in the reconstruction of the works, one of the results of which was the advantageous working to which he had referred. Under the heading of distribution, the principal item was an increase of expenditure of £1100 on repair and maintenance, &c., of mains. It was found that, in one or two districts, the consumers were short of gas, owing to the inadequacy of the mains. They had therefore laid new mains, and had disused old mains in these districts. They had also examined, and thrown out of use, other old and duplicate mains; and the cost of this work had been charged almost entirely to revenue. The two-fold benefit of this mainlaying work was that consumers who were formerly complaining had now a satisfactory supply; and the unaccounted-for gas had also been much reduced. Repairing, renewing, and refixing of meters was responsible for an additional £200 expenditure; and £1000 had been spent in the half year for repairing, renewing, and refixing stoves and fittings. The other items varied very little from those in the corresponding half of 1908; and the net result was that the profit was £3405, against £2730 for the corresponding period of 1908. It would be thought be interesting to the proprietors to know that the quantity of gas made during the six months had been 82,584,000 cubic feet—an increase over the make in the corresponding six months of 1908 of 4,898,000 cubic feet. The quantity sold was 75,905,300 cubic feet—an increase of 4,542,300 cubic feet. The gas made per ton of coal exhibited an increase of 898 cubic feet, compared with the December half of 1908. The coal carbonized, notwithstanding the greater make of gas, decreased by 99 tons—the total quantity being 6717 tons. The sulphate of ammonia made was 53¾ tons; coke made, 6397 chaldrons; coke sold, 5103 chaldrons—the last-named figure having increased by 343 chaldrons. In all, 243 new gas service-pipes were laid.

Turning to the water department, the gross revenue showed the pleasing increase of upwards of £1000. But in common with other companies, they had to record a large number of empty houses; so that the allowances under this heading were £100 more than last year. In respect of maintenance, £350 more had been spent on works; and £300 more for repairs of mains and services. Here, again, the increased cost had been due to the disusing of old duplicate mains. The other items of expenditure were practically normal; and the net result was that they had a profit of £10,134. It was gratifying to note that, although the average population supplied with water in 1909 showed a considerable increase, the consumption had been reduced. This was probably due to the wet autumn and winter; and to the vigilance which was now being exercised to stop small leaks, and to obtain the prompt repair of defective service-pipes and fittings. The Directors confidently looked to the consumers for assistance in these matters, which were necessary for the prevention of waste and misuse

of water. The aggregate profit for the past half year was £13,632, which would enable the Directors to place £1000 to the contingency fund, in accordance with the resolution of the proprietors, provide for the interest on temporary loans, mortgage bonds, and debenture stock, pay the dividends, and also carry forward an increased balance. Adverting to the report, it was with pleasure that he drew attention to the fact that the appeal, in regard to the sinking of a well, of the Company against the judgment of Mr. Justice Ridley resulted in the Company's favour; but the Marquis of Salisbury had given notice of appeal to the House of Lords, which it was anticipated would be heard very shortly. In the opinion of the Directors, it certainly seemed anomalous that a Company specially created with parliamentary sanction for the purpose of supplying water in a large and growing district should be deprived of the means of affording that supply, and should have to spend very large sums of money in endeavouring to secure the rights which it was certainly the intention of Parliament to grant to them. The Company had never hesitated to spend their money freely in their efforts to afford a full and satisfactory supply of water. He was pleased to say that, at the present time, there were practically no complaints; and the Company were on good terms with all the local councils. Finchley had been given a constant supply in accordance with the Company's Act; and to meet the wishes of the Barnet District Council, an extended supply had been afforded to that district.

The financial outcome for the half year, as contrasted with that of the corresponding period of 1908, had been: Profit on gas, £3405; profit on water, £10,134; profit on fittings, £93—making a total profit of £13,632. This represented an increase of profit on gas of £675, and on water of £224. From the total of £13,632, they had to deduct interest and income-tax £2230; the dividends recommended, £9846; and to transfer £1000 to the contingency account. This would leave £555 to be added to the balance brought forward (£17,687); making £18,243 to be carried forward. Some of the proprietors present would doubtless remember that, at the half-yearly meeting in March last year, he stated that the Board had unanimously appointed Mr. F. J. Bancroft, B.Sc., M.Inst.C.E. (for several years Engineer and Manager of the Hull Corporation Gas and Water Works), to the then vacant position of Engineer and Manager of their own Company. He then further congratulated the Company on this appointment, and stated that it was, in the judgment of the Board, an appointment that would be of signal advantage to the Company—resulting in increasing progress and prosperity. On this occasion, he (the Chairman) felt that, in the report before the proprietors, they had abundant proof of the wisdom of the appointment; and he was confident that he expressed the feelings of all the Directors when he said that, in their opinion, no better selection could have been made. The satisfactory results of the half-year's working were mainly due to Mr. Bancroft's untiring efforts and administrative ability, aided by a most efficient staff; and this constituted a very sure guarantee of still further success in the future. He could not doubt that the shareholders would cordially agree in this expression of appreciation of the past half-year's management.

The DEPUTY-CHAIRMAN (Dr. J. W. Lee Glaisher) seconded the motion.

Mr. DYER heartily congratulated the Board on the balance-sheet, and the excellent results of the working of the half year. It was apparent from the accounts and the Chairman's remarks that the Directors had not in any way starved the concern.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared, less income-tax for the half year, at the rates per annum of 7½ per cent. on the "A" and "C" stocks, 6½ per cent. on the "B" stock, and 5½ per cent. on the "D" capital, gas and water stocks.

On the motion of Mr. ALFRED LASS, seconded by Mr. FREDK. LENNARD, the retiring Directors (Mr. A. H. Baynes and Dr. Glaisher) were re-elected, as was also the retiring Auditor (Mr. B. Dennett Holroyd), on the motion of Mr. SAMUEL SPENCER, seconded by Mr. DYER.

On the proposition of Mr. A. F. PHILLIPS, seconded by the DEPUTY-CHAIRMAN, a cordial vote of thanks was passed to the Secretary (Mr. Drew), the Engineer (Mr. Bancroft), Mr. Wright, the staff, and workmen generally.

A similar compliment was also paid the Chairman and Directors, on the motion of Mr. SPENCER, seconded by Mr. W. TIBBS.

Extensions of Retort-House Machinery.

Sir William Arrol and Co., Limited, of the Dalmarnock Iron-Works, Glasgow, have just received from the Sheffield United Gaslight Company an order for a complete installation of hydraulic stoking plant for their Neepsend works. This includes the Arrol-Foulis charging machine and the Hunter-Barnett patent coke-pusher, besides pumping engines, accumulator, and accessories. The Brighton and Hove General Gas Company have also decided to instal the Hunter-Barnett coke-pusher at their Portslade works; and Sir William Arrol and Co. have this contract in hand at present.

London County Council.—The final meeting of the Council as constituted by the election in 1907 was held last Tuesday, when the report of the Local Government Committee on the financial position of the Metropolitan Water Board, given in the "JOURNAL" for the 15th ult. (p. 456) was adopted after a short discussion; and that of the Parliamentary Committee on the Gas Companies Standard Burner Bill, noticed last week (p. 604), was agreed to without comment.

Co-Partnership at Watford.—At the recent half-yearly meeting of the Watford Gas Company, the Secretary and General Manager (Mr. J. Duncan Royal), in responding to a vote of thanks passed to the members of the staff for their assiduity and zeal in the interests of the Company, referred to the co-partnership scheme which has been introduced, and said he thought that nothing the Directors could have done could be so much for the good of the men. The scheme was only in its infancy at present; but the whole-hearted way in which it had been taken up, augured the very best for it in the future.

PROVINCIAL GAS COMPANIES.

A Good Increase at Brighton.

The report presented at the half-yearly meeting of the Brighton and Hove Gas Company on the 25th ult. opened with the statement that, in comparison with the figures for the six months ended the 31st of December, 1908, the sale of gas in the corresponding half of last year showed an increase of 35,802,300 cubic feet, or 5·9 per cent.; but the sale of residuals again yielded less. The revenue from the sale of 633,284,300 cubic feet of gas was £93,360; and the total revenue came to £118,777. The expenditure having been £90,743, there was a balance of £28,034 to go to the profit and loss account. Adding the balance brought forward (£13,364) and a small amount received for interest, produced a total of £41,434. After charging interest on debenture stock, &c., and transferring £2000 to the insurance fund, there was a sum of £36,610 available for distribution; and the Directors recommended the declaration of dividends at the statutory rates of 6, 4, 11, and 8 per cent. per annum on the several classes of stock. These payments would amount to £23,652, and leave £12,958 to be carried forward.

Progressive and Eventful Year at Eastbourne.

The half-yearly general meeting of the Eastbourne Gas Company was held on Monday last week, when the Directors reported that there was a profit of £8525 on the revenue account for the six months ended Dec. 31, and a balance of £16,600 available for distribution. The Directors therefore recommended the declaration of a dividend for the half year at the rate of 15½ per cent. per annum on the original capital, and on the capital raised on "C" shares; at the rate of 12½ per cent. per annum on the capital raised on "B" shares; and at the rate of 5 per cent. per annum on the 5 per cent. preference stock. These payments would absorb £8472, and leave £8128 to be carried forward. The Directors added that, under the provisions of the Act obtained last session, the necessary mains had been laid to convey a supply of gas to Polegate and Hailsham; and this extension of the Company's area was proving satisfactory to all concerned. The Chairman (Dr. G. A. Jeffery, J.P.), in moving the adoption of the report, said the past year had been a progressive and eventful one. The sale of gas had gone up from 220,124,000 cubic feet this time last year to 235,652,000 cubic feet—an increase of 15,528,000 cubic feet, or 7·05 per cent. The number of consumers was now 4781 ordinary and 4642 prepayment—together, 9423, or a gain in the year of 569. The leakage was reduced to 5·65 per cent., against 6·94 per cent. before—a decrease of 1¼ per cent. The net profit was £8525, against £8369 last year; being more by £156. This profit was £52 14s. 2d. above the amount required to pay the dividend. Having dealt with various items in the accounts, the Chairman reminded the shareholders that at the beginning of the year the Company lowered the price of gas 2d. per 1000 cubic feet, from 2s. 8d. to 2s. 6d.—entailing a loss for the half year of nearly £2000. This was a loss for the year of about £4000, which practically represented a free gift to the gas consumers of Eastbourne. At the meeting in August, he thought that before the year was out there would be, at this low cost, an increased consumption of gas. His opinion had proved to be correct, for already they had nearly overtaken the loss of the £2000, and secured a profit of £8525, which not only enabled them to pay dividends of 15½ and 12½ per cent., but to carry forward an almost similar sum (more than £8000) to the account for the next half year. The Chairman went on to refer to the extension of the Company's area sanctioned by their Act of last session, and stated that the Directors had purchased 900 tons of pipes and placed them in nine miles of hard, hilly road, 2 ft. 6 in. in depth, employing 60 men for four months; and during the work there had not been a single accident to life or limb, nor a single complaint from anyone whose district was gone through. The Directors had many meetings and many interviews with their Consulting Engineer (Mr. H. E. Jones), for they were determined to bring to a successful issue what they had set their hands to. They were ably assisted by the Secretary (Mr. J. S. Garrard) and his efficient staff, who worked willingly and heartily, and by the Manager (Mr. John Hammond) and his men at the works, who did their share. All, in fact, assisted to bring the past eventful half year to a successful conclusion, and the Directors offered them their best thanks. The report was adopted and the dividends were declared. A vote of thanks having been accorded to the Directors, officers, and workmen for the care with which they had conducted the business of the Company, as shown in the accounts and by the growth and progress made, the Chairman was thanked for his attention to the business of the day; and he briefly acknowledged the compliment. Mr. Garrard returned thanks on behalf of the officials, and made a few explanatory remarks in regard to the new issue of capital by the Company, as announced elsewhere in the "JOURNAL."

Profit Sharing and Increased Rental at Enfield.

At the half-yearly meeting of the Enfield Gas Company on the 24th ult., the accounts presented showed that the revenue in the six months ended Dec. 31 was £24,406, compared with £24,154 in the latter half of 1908. The expenditure was £18,931, against £17,491; and the balance carried to the profit and loss account £5475, against £6663. The profit for the half year, after providing for net interest charges, amounted to £4898; and the Directors recommended a dividend at the rate of 5 per cent. per annum on the consolidated preference stock and of 5½ per cent. per annum on the consolidated ordinary stock, both less income-tax. The sale of gas in the half year amounted to 106,232,500 cubic feet; being 99,168,100 cubic feet for private purposes and 7,064,400 cubic feet for public lighting. The Chairman (Sir Alfred Somerset, K.C.B.), in moving the adoption of the report, said the bonus scheme, formulated in the June half year to give the employees of the Company a direct interest in its affairs, had been vitalized during the period under review; and he was now able to announce that every officer and workman in the regular employ of the Company had signed the service agreement which gave the title to participate in its benefits. He felt very hopeful from the attitude of the employees at the meeting at which the scheme was explained to them, and subsequently, that the

latent mutual advantages to the proprietors, the employees, and the consumers of gas would be manifested. The new gasholder [described in the "JOURNAL" for Nov. 16 last] had been formally brought into use in the period covered by the report. By it the storage capacity of the Company had been increased from 700,000 to 1,700,000 cubic feet. The Engineers (Messrs. W. A. Valon and Son) had pronounced it to be a satisfactory piece of construction; and from the cost point of view, the Company had every reason to be satisfied also. The accounts presented for the shareholders' acceptance exhibited the very gratifying feature of an increased rental from the sale of gas, though the price per 1000 cubic feet had been reduced over the whole of the six months by 2d. from the rate current in the corresponding part of the previous year. Mr. Alfred Ford, in seconding the motion, dealt with the matters of principal interest in the accounts. Comparing these with the figures for the December half year of 1908, he pointed out that the gas sold had increased by 5¾ per cent., representing 5,767,700 cubic feet; bringing up the total sold to 106,232,000 cubic feet. The reduction in the price of gas referred to by the Chairman had benefited the consumers by upwards of £800 in the half year. Rentals of meters, stoves, and fittings totalled an extra £182. The makes of gas and coke for sale per ton of coal used had kept up to the high standard reached in 1908. The motion was carried, and the dividend recommended declared. The meeting terminated with resolutions expressing the thanks of the proprietors to the Directors and staff, which were acknowledged by Dr. Collyer and Mr. C. W. Offord, the General Manager.

Satisfactory Increase at Exeter.

At the annual meeting of the Exeter Gas Company on Monday last week, the Directors reported an increase of 17½ million cubic feet in the sale of gas in the twelve months ended Dec. 31, a portion of it being due to the cold weather prevailing in the spring and autumn. They expressed their pleasure in announcing a reduction of 2d. (from 2s. 9d. to 2s. 7d.) per 1000 cubic feet in the price of gas used for general purposes, and of 1d. from the prices now being paid for gas consumed for the production of motive power. The accounts accompanying the report showed a balance of £20,079 available for distribution; and the Directors recommended dividends of 10 and 7 per cent. per annum on the original stock and the new ordinary shares, together with an additional dividend to reimburse the shareholders for the deductions for income-tax. The Chairman (Mr. G. Hardy Harris), in moving the adoption of the report, remarked that, in spite of competition, the Company had had a good year; the sale of gas having considerably increased. Several improvements were made in the manufacturing plant—one of the alterations being the introduction of special apparatus to deal with the inconvenience caused to consumers through their services becoming blocked; and he was glad to be able to announce that since it had started the number of complaints up to Christmas last had been reduced 50 per cent., while for the month of January the reduction was 75 per cent. This result would, he felt sure, be received with considerable satisfaction by the consumers. As announced in the report, the Directors had been able to reduce the price of gas by 2d. per 1000 cubic feet from Christmas last. The policy of supplying gas as cheaply as possible to the public was one which the Board had adopted for many years, and one which greatly contributed to the stability of the Company. The motion was seconded by Mr. J. Langdon Thomas, and carried unanimously. The dividends having been declared, and the retiring Directors and Auditor unanimously re-elected, a vote of thanks was accorded to the Chairman. A special meeting was then held to consider the Gas Companies (Standard Burner) Bill. The Chairman remarked that from the report of the discussion at the recent meeting of the City Council it would appear that some people were of opinion that the Gas Company wished to evade their responsibilities. This was not so. The proposed alteration of the test-burner was only a matter of justice to the Company, as they were working under old and obsolete regulations from which many other undertakings having modern Acts of Parliament had been relieved. They simply wished that there should be one standard burner throughout the country for all gas undertakings, and that this burner should be the best possible one with which to burn the gas. It must be emphatically stated that the movement commenced by the Associated Gas Companies, numbering 47 in all, was one that was going to benefit the consumer. The effect of the adoption of the modern test-burner would be to prevent waste and reduce the cost of production; and the public would thus ultimately be the gainers. Mr. W. R. Moore seconded the motion; and it was carried unanimously.

Reduced Price and Increased Consumption at Harrogate.

There was a large attendance at the annual meeting of the Harrogate Gas Company on Monday last week, when the accounts presented showed that the profit for the past year was £13,111; the revenue having been £48,869 and the expenditure £35,758. The net revenue was £22,383, out of which the Directors proposed to pay dividends at the same rate as before, which would absorb £10,080 (less the interim dividend), place £1022 to the reserve fund, and carry forward the balance of £16,320. They reported that the reduced price of gas of 2d. per 1000 cubic feet had slightly affected the revenue from the sale of gas; but there had nevertheless been an increased consumption to the extent of 3,667,300 cubic feet. According to a statement by the Secretary and General Manager (Mr. Harry Wilkinson), the quantity of gas made last year was 297,126,500 cubic feet, of which 276,495,300 cubic feet were sold, and 282,140,700 cubic feet accounted for. The Chairman (Mr. F. Barber), in moving the adoption of the report and accounts, referred to the brighter outlook in the coal trade, and at some length to the action of the Harrogate Corporation in connection with electric lighting. [This matter is referred to elsewhere to-day.] Having regard to the improved working results and the economies effected by the management, he said he had never entertained brighter hopes for the future success of the undertaking than he did now. Though the total figures on both sides of the revenue account were only normal, there were underlying factors in the items that made them up which opened out much promise for the future. The reduction of 2d. per 1000 cubic feet which had operated during the whole of the past twelve months was accountable for a reduction of £2273 in the receipts; but this had been more than met by the increased yield of coke and other residuals from 669 tons of coal carbonized less than in the preceding year, the reduced cost of coal, and great economies in management. The report was adopted. The retiring Directors and Auditors having been re-elected, an extraordinary meeting was held, at which it was resolved to empower the Directors, in addition to the stock authorized to be raised by the resolution passed April 8, 1907, of which £15,000 remains unissued, to issue £30,000 further stock of the class which shall be determined by them. A vote of thanks to the Chairman, Directors, officials, and staff brought the business to a close.

Record Half Year at Hastings.

As the half-yearly meeting of the Hastings and St. Leonards Gas Company last Thursday, the Directors reported that the sales of gas in the six months ended Dec. 31 exceeded those of the corresponding period of 1908 by 5 per cent. The total quantity sold, as shown by the accounts, was 234,712,600 cubic feet, out of a make of 247,970,000 cubic feet, of which 77,477,000 cubic feet were oil gas. The accounts also showed that the revenue for the half year was £44,967, and the expenditure £30,396; leaving a balance of £14,571 to go to the profit and loss account. A sum of £2000 was written off the old works and plant, and £200 for loss in connection with public lamps discontinued. The balance of net profit was £57,818; and the Directors recommended the payment of dividends for the half year at the statutory rates per cent. per annum of £6 10s., £5, and £6 1s. on the 5 and 3½ per cent. converted stocks and the 5 per cent. additional stock, all less income-tax. The Chairman (Dr. G. G. Gray, J.P.), in moving the adoption of the report and accounts, characterized the latter as exceptionally satisfactory, showing as they did that during the past half year there had been an increase of 5 per cent. in the quantity of gas sold, which was equivalent to something over an increase of 11½ million cubic feet. They had made the largest profit balance that his memory went back to—a balance sufficient to pay all their outgoings, provide their full statutory dividends, write off a substantial amount, and leave something to be carried forward. The past half year would be difficult to beat. Comparing it with the corresponding period of the preceding year, the increase from the sale of gas, including meters and stoves, amounted to £252, notwithstanding the reduction in the price of gas. In residuals there was a net decrease amounting to £1034. On the expenditure side there was a saving of £3140, including a net decrease on coal, under repairs, and rates, taxes, and insurance. They had not been let off with less rates than other ratepayers; but the corresponding half year had shown an increase owing to the manner in which rates had been collected. They had an increased profit balance of £2404 for the half year. Mr. A. W. Oke seconded the motion; and it was carried. A vote of thanks having been accorded to the Chairman, Directors, officers, and staff, the Chairman and the Engineer and General Manager (Mr. Charles E. Botley) responded; the latter referring to the interest taken in their work by all the men. A special meeting was then held to sanction the association of the Company with other gas companies in the promotion of the Standard Burner Bill. The Chairman (who is a member of the Corporation), explained the effect of the adoption of the new burner, and said it would be to the advantage of consumers even more than stockholders. The Corporation had decided to oppose the Bill. Not one of the opposing local authorities did so on the merits of the proposal, but on a sort of roving or fishing expedition, to try to get something out of the gas companies, who had wisely decided to stand or fall together. No explanation of the Bill had been given to the Town Council; and probably not one member of the Corporation who was not connected with the Gas Company had ever seen the burner, or knew the difference between it and the one now used for testing gas. He doubted whether any member knew what was in the petition which had been ordered to be sealed. Such action brought the Town Council into disrepute. He moved a resolution approving the Bill. Mr. Botley, in supporting it, said the standard of illuminating power of the gas would not be lowered by the adoption of the new burner. The motion was carried unanimously. The Chairman added that he had explained the Bill because he did not want the shareholders to be like their friends on the Town Council—opposing what they knew nothing about.

Record Year at Ilfracombe.

The Ilfracombe Gas Company have every reason for congratulation on the results of their last year's working. As the Chairman (Mr. W. C. Rafarel) remarked at the annual meeting last Wednesday, the financial position is highly satisfactory; while the sale of gas reached the highest figure recorded in the history of the Company. A sum of £3021 which had been lent from the reserve fund to the capital account has been replaced in the reserve fund; and there has been transferred from this fund to the capital account the sum of £4618. The effect of this is to leave a balance in hand on capital account of £2093, which may be regarded as working capital. With reference to the revenue account, Mr. Rafarel stated that the cost of coal showed a reduction of £100, though the quantity used was 200 tons more. Other items of expenditure were about the same as in the previous year. The income from private lighting increased by £138, despite a reduction in the price during the year. The experience of an increase in consumption following a reduction in price would encourage the Directors to make a further concession at the earliest possible moment. The sale of gas exceeded by 1,717,700 cubic feet any previous sale. The revenue from residuals had increased by £121. The balance-sheet showed a balance to the profit and loss account of £3277, which was £300 more than the previous year. The report and balance-sheet were adopted; and dividends were declared of 5 per cent. on the preference stock and 5 per cent. on the ordinary consolidated stock. The staff and workmen were thanked; special reference being made to the work of Mr. J. Armstrong, the Manager, and Mr. A. Norman, the Secretary.

Lower Price and Increased Profit at Leighton Buzzard.

The report submitted at the recent meeting of the Leighton Buzzard Gas Company stated that the revenue account for the year ending Dec. 31 showed a profit of £2083. This amount, with the sum brought forward, made a balance of £2773 standing to the credit of the profit and loss account. Out of this, the Directors recommended the pay-

ment of dividends at the rate of 10 per cent. per annum on the original stock, and 7 per cent. per annum on the new ordinary stock, less income-tax, together amounting to £1717, and that £300 be carried to the reserve fund. The Chairman (Mr. R. Richmond) remarked that the report was a very satisfactory one. They had made a reduction of 3d. per 1000 cubic feet in the price of gas during the year; but their net profit showed an increase of £130. Whether they would be able to reduce the price of gas still further next year, depended entirely upon the cost of coal. If the price of coal remained at the same figure as last year, he believed they would be able to take a little more off—possibly 1d.; but he was afraid, on viewing the state of the coal market, that they would have to pay a little more for coal. The Company's works were in good condition; and they had a splendid report from their Manager (Mr. C. F. Ruggles). The number of consumers compared favourably with similar towns. Recently they looked into the matter; and they found that, for towns of their size, they stood second in the number of slot meters installed. The town acknowledged to be first was High Wycombe; but in dealing with that town, they were considering an exceptional case. At High Wycombe, there were a great number of small workers; and a lot of work was done at home. It was also interesting to know that at High Wycombe the charges for gas were 9d. higher. The report was adopted, and the Directors' fees were raised. In proposing a vote of thanks to the staff, the Chairman said he was pleased to see Mr. Ruggles on the way back to perfect health; and he trusted that for many years to come he would attend the meeting looking as well as he did on that occasion.

Satisfactory Year and a Jubilee at Redhill.

At the recent fiftieth annual meeting of the Redhill Gas Company, the Directors reported that the business of the Company had made satisfactory progress during the year ended Dec. 31. The total number of consumers was 4360; and the number of cooking and heating stoves on hire had increased to 2702. The lower price of coal which obtained during the year had appreciably relieved the cost of manufacture. The Directors regretted to note, however, that the result of the Coal Mines (Eight Hours) Act held out little prospect of such favourable prices being maintained. The accounts accompanying the report showed a balance of £8691 available for distribution; and the Directors recommended dividends of 10 per cent. on the share capital, and 5 per cent. on the "B" stock, both less income-tax, leaving a balance of £1003 to be carried forward; interim dividends of 4½ and 2½ per cent. respectively having been paid on the 1st of September. They also recommended that the remuneration of the Secretary (Mr. H. Long) be increased £50 per annum. The Chairman (Mr. G. R. Hunt), in moving the adoption of the report, said he thought the shareholders could feel satisfied with the result of the past year's working. A fair increase in the revenue from the sale of gas was shown; but this improvement had been offset by a smaller revenue from residuals, principally due to the lower price of coke. Having dealt with various matters connected with the working of the Company in the period covered by the report, the Chairman remarked that it was the last annual report of half-a-century's working. The Company was formed early in the year 1860, with a capital of £3000. It was interesting to note that the revenue of the Company at the end of each succeeding ten years up to the present time reached the following figures; In 1869, it was £3580; in 1879, £8840; in 1889, £12,214; in 1899, £20,464; and in 1909, £29,156. The Company's returns had thus shown steady progress, in spite of the depression in trade of recent years, and in the face of the competition brought about by the Corporation nearly nine years ago. The district, especially in the outlying parishes, was still growing in favour as a residential centre; and the Directors had every reason to hope that the Company's business would maintain the satisfactory rate of progress hitherto shown. Their Manager (Mr. James Paterson, M.A) reported that the works and plant were in a thoroughly efficient state, and, in consequence of the many improvements in the new retort-house, an appreciable reduction in the cost of manufacture had been brought about. The manufacturing plant was not only capable of producing all the gas at present required, but was so designed that it would be sufficient to meet a far greater demand as the development of the district continued. Mr. A. W. Oke seconded the motion; and it was carried. The increase in the Secretary's salary having been unanimously agreed to, a vote of thanks was accorded to the officers, which was acknowledged by Mr. Long and Mr. Paterson. A similar compliment was paid to the Chairman and Directors.

Continued Prosperity at Richmond.

At the recent half-yearly meeting of the Richmond (Surrey) Gas Company, the Directors, in their report, congratulated the shareholders on the satisfactory results shown by the statement of accounts, and recommended the declaration of a dividend for the six months ended Dec. 31 at the rate of 5¼ per cent. per annum. Mr. A. Chancellor, who presided, in the absence, through illness, of Mr. T. J. Carless, the Chairman, in moving the adoption of the report, said there had been an increase in the consumption of gas. Coals had cost more than £1000 less than during the corresponding half of 1908; about £700 of this sum being due to more favourable markets, and the balance being the result of a larger quantity of gas being produced per ton of coal used. They had taken the precaution of laying in large stocks, and had got through the period of the largest production with sufficient coal left to cover fully two months' requirements. While there had been increases in the receipts from the sale of gas and the rental of meters and stoves, coke showed a falling off of upwards of £500. The profit and loss account showed the Company to be in a satisfactory position. Mr. Pulman seconded the motion, which was carried, together with the recommendation as to the dividend. The retiring Directors having been re-elected, the Chairman moved a vote of thanks to Mr. T. May (the Engineer and Secretary) and the staff for their valuable services; and it was carried. Mr. May briefly returned thanks. A similar vote was passed to the Directors. A special meeting was then held, at which a resolution was duly passed approving of the Gas Companies' (Standard Burner) Bill.

Reduction in Price at Southend.

The half-yearly report of the Directors of the Southend Gas Company stated that there had been an increase in the quantity of gas sold of 7·03 per cent. as compared with the corresponding six months of the previous year. The number of consumers had increased by 787; there being on Dec. 31 13,185, of whom 9005 had automatic meters. It was with deep regret that they reported the death of Sir W. Lloyd Wise, who was elected to the Board over seven years ago. The profit

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 642.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Oct 14	5	Alliance & Dublin Ord.	86–88	..	5 13 8
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98–100	..	4 0 0
200,000	5	Oct. 28	6½	Bombay, Ltd.	6–6½	..	5 4 0
40,000	5	,,	6½	Do. New, £4 paid	4⅝–4¾	..	5 6 8
50,000	13	Feb. 25	15	Bourne- 10 p.c.	29–30*	..	5 0 0
311,810	13	,,	7	mouth Gas B 7 p.c.	16½–16¾*	..	4 3 7
75,000	10	,,	6	and Water Pref. 6 p.c.	15–15¾*	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	250–253*	..	4 18 10
300,000	,,	,,	9½	Do. New	187–189*	..	5 0 6
50,000	,,	Aug. 12	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	Dec. 29	4	Do. 4 p.c. Deb.	101–103	..	3 17 8
220,000	Stk	Sep. 10	11	Brighton & Hove Orig.	218–221	..	4 19 7
246,320	,,	,,	8	Do. A Ord. Stk.	154–157	..	5 1 1
467,000	23	Oct. 14	10⅝†	British	44½–45½	+2	4 13 6
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	116–118*	..	5 1 8
165,700	,,	,,	4½	Do. B 3½ p.c.	87–89*	..	5 1 2
82,278	,,	,,	5½	Do. C 5 p.c.	103–105*	..	5 4 9
55,003	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	87–89	..	3 18 8
503,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14⅜–15½	..	4 11 10
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	93–100	..	4 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4–5	+1	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅛–6⅛	+⅛	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48½–49½	+½	6 1 3
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	83–85	+3	5 5 11
157 153	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	103–108*	..	4 12 7
1,513,280	Stk.	Feb. 25	5⅝	Commercial 4 p.c. Stk.	105–108*	..	4 16 4
560,000	,,	,,	5	Do. 3½ p.c. do.	103–105*	..	4 15 3
475,000	,,	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81–83	..	3 12 3
800 000	Stk.	Dec. 10	5	Continental Union, Ltd.	96–98	+1	5 2 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137–139	..	5 0 9
492,270	Stk.	—	5	Derby Con. Stk.	121–123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
148,995	,,	Oct. 2	5	East Hull 5 p.c. Ord.	98–100	..	5 0 0
486,090	10	Jan. 27	12	European, Ltd.	24½–24¾	..	4 17 0
354,060	10	,,	12	Do. £7 10s. paid.	18½–19	+½	4 14 9
15,141,545	Stk.	Feb. 10	4⅝	Gas 4 p.c. Ord.	104–105	–⅛	4 8 10
2,600,000	,,	,,	3¼	light 3½ p.c. max.	88–90	+1	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	103–105	..	3 16 2
4,193,975	,,	Dec. 29	3	Coke 3 p.c. Con. Deb.	81–83	..	3 12 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	95–97	..	5 3 1
82,500	,,	,,	6½	Do. do. 5 p.c.	119–121	..	5 7 5
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17⅞–18	..	6 2 3
131,020	Stk.	Sep. 10	7½	Ilford A and C	145–147	..	4 15 3
65,780	,,	,,	5½†	Do. B	109–111	+1	4 19 1
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	100–102	..	3 18 5
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175–177	..	4 10 5
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92–94	..	3 14 6
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120–122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A	222–224*	..	4 9 3
718,100	,,	,,	7	Do. B	163¼–165½*	..	4 4 7
306,083	,,	Dec. 29	4	Do. Deb. Stk.	103–105	..	3 16 2
75,000	5	Nov. 26	6	Malta & Mediterranean.	4⅞–5	..	6 0 0
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99–102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd.	12⅝–13¾	..	5 5 8
1,775,892	Stk.	Feb. 25	4⅜	Newc'tle & G'tesh'd Con	104–105*	..	4 3 4
529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91–93	..	3 15 3
55,940	10	Feb. 25	7	North Middlesex 7 p.c.	12⅞–13¼*	..	5 5 8
300,000	Stk.	Nov. 26	8	Oriental, Ltd.	138–140	..	5 14 4
60,000	5	Sep. 10	8	Ottoman, Ltd.	6⅛–6⅜	..	6 5 6
31,800	53	Feb. 25	13	Portsea Island A.	134–136*	..	5 1 0
60,000	50	,,	13	Do. B.	126–128*	..	5 1 7
100,000	50	,,	12	Do. C.	119–121*	..	4 19 2
114,800	50	,,	10	Do. D and E.	100–102*	..	4 18 0
398,490	5	Oct. 28	7	Primitiva Ord.	7⅞–7⅞	..	4 8 11
796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	5⅛–5⅜	..	4 8 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	99–101	+1	3 19 3
1,000,000	10	Oct 14	8	River Plate Ord.	17¾–18½	..	4 7 8
312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
250,000	10	Sep. 29	9†	San Paulo, Ltd.	16–16½	+1½	5 9 1
62,500	10	,,	6	Do. 6 p.c. Pref.	11½–12½	..	4 18 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50–51	..	4 18 0
135,000	Stk.	Sep. 10	10	Sheffield A	233–235	..	4 5 1
209,984	,,	,,	10	Do. B	233–235	..	4 5 1
523,500	,,	,,	10	Do. C	233–235	..	4 5 1
70,000	10	Oct. 14	10	South African	12½–12⅝	..	7 16 11
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120–122	..	4 9 7
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	82–84	..	3 11 4
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	161–162	..	4 18 9
605,000	Stk.	Feb. 25	5⅝	S'th Suburb'n Ord. 5 p.c.	120–122*	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	119–121*	..	4 2 8
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	121–123	..	4 1 4
502,310	Stk.	Nov. 11	5	Southampton Ord.	110–112	..	4 9 3
120,000	Stk.	Feb. 10	6¾	Tottenham A 5 p.c.	133–135	..	5 1 9
453,940	,,	,,	5⅝	and B 3½ p.c.	112–114	+1	4 14 4
149,470	,,	Dec. 29	4	Edmonton 4 p.c. Deb.	98–100	..	4 0 0
182,380	10	Dec. 29	8	Tuscan, Ltd.	9¼–9⅝	..	8 4 2
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99–101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p c max.	112–114*	+⅛	4 7 9
255,636	Stk.	Feb. 25	6⅝	Wands- B 3½ p.c.	139–141*	..	4 14 0
79,416	,,	Dec. 29	3	worth 3 p.c. Deb. Stk.	74–76	..	3 18 11

Prices marked * are "Ex div." † Next dividend will be at this rate.

and loss account showed a net amount available for dividend of £10,351; and it was recommended that payment of dividends be sanctioned at the rate of 5⅜ per cent. per annum on the original consolidated and new ordinary stock, and 5⅝ per cent. per annum on the new ordinary "B" stock (all less income-tax), which would amount to £6849, leaving £3502 to be carried to the next account. The Directors had given notice that, from the reading of meters for the Lady Day quarter, the price of gas would be reduced 2d. per 1000 cubic feet. An equivalent reduction would be made to consumers by automatic meters. The Chairman (Mr. C. F. Woosnam) said the reduction in the price of gas would cost the Company over £3000; but they had been able to make a good contract for coals, and with the new stoking machinery they hoped to save a fair share of the extra cost. In fixing the price of gas, they ought first of all to consider the people who were going to buy it. They had therefore thought of their customers and not of themselves. The report was adopted; and the payment of dividends authorized as set forth in the report. The meeting concluded with a vote of thanks to the Chairman, who, in reply, referred to the efficient services rendered to the Company by the Engineer and Manager (Mr. F. Clark), the Secretary (Mr. J. T. Randall), and the staff.

Dessau Vertical Retorts Satisfactory at Sunderland.

The specially interesting feature of the proceedings at the annual meeting of the Sunderland Gas Company last Wednesday was the statement by the Chairman (Alderman S. Richardson), when moving the adoption of the report, that the Dessau system of vertical retorts which had been adopted at the Ayres Quay works—the first installation of these retorts in England—described in the "JOURNAL" for the 6th of July last (p. 25), had yielded results which indicated that the expectations in regard to them would be realized. The Chairman referred with regret to the death of the Secretary and Manager (Mr. J. H. Cox), and to the appointment of his son (Mr. Norman S. Cox) as Secretary and Mr. C. Dru Drury as Engineer. In regard to the working of the Company, the make and sale of gas still reflected the depression in trade, though the revenue from this source was slightly more than for 1908. The explanation was that the reduction was due mostly to a lessened consumption of gas for power purposes; while for lighting and heating, more gas had been consumed. He attributed the ability of the Company to continue to pay the maximum dividend to favourable contracts for coal and a rather improved yield per ton carbonized, satisfactory prices for coke, and other residuals, and careful management. While there had been a decrease in revenue, there had been a still larger one in expenditure. As to the coals—a matter of chief concern—they had stored at both works as much as they could, and they were in a safe position for any shortage in the near future. Colonel T. W. Stuart, in seconding the motion, said a considerable saving in labour was being effected by the vertical retorts, and the yield of gas would, the Directors believed, be very considerably increased. They also expected a larger yield of sulphate of ammonia. The production of naphthalene was almost entirely done away with, and the trouble caused by it was thus removed. There was also an improvement in the quality of the coke. The report and accounts were adopted; and the dividend was declared as recommended—viz., 5 per cent. on the original stock, and 4¼ per cent. on the additional stock. It was decided to increase the remuneration of the nine Directors from £750 to £1000 a year.

Mechanical Stoking to be Adopted at Sutton.

In the report for the six months ended Dec. 31 last which the Directors of the Sutton (Surrey) Gas Company presented at the recent half-yearly meeting, they stated that the sales of gas had increased 10,629,200 feet over the same period of 1908, or 11·1 per cent.; and the revenue advanced by £1659. The balance available for distribution amounted to £12,979, from which the Directors recommended payment, under the sliding-scale, of a dividend at the rate of 5¾ per cent. per annum (less income-tax) for the half year. The Chairman (Mr. F. Budgen, J.P.), in moving the adoption of the report, said it showed that the undertaking was growing. There were 52 miles of mains which required keeping in order. This was at present rather more trying than in years past, owing to the heavy traffic upon the roads, and especially the motor vehicles; but he did not think they had much cause for complaint, which was proof that their mains were very well laid and the work had been well looked after and supervised by their staff. The gas consumed was 105,554,800 cubic feet, or about 11·1 per cent. more than in the half year ended Dec. 31, 1908; while the number of consumers was 5745, or 278 more. The ordinary consumers were 2900; and the slot-meter consumers practically an equal number—2845. There were 1325 gas-cookers and 536 fires on hire. Owing to the rapid growth of the business, the Board were considering the advisability of introducing mechanical stoking and coal and coke handling plant. They had visited places where such machinery was in operation, and were satisfied that it would result in a great saving; and contracts had been accepted for the completion of the large retort-house, to make it possible for the system to be introduced. The report was adopted and the dividend recommended declared; and the proceedings closed with an expression of thanks to the Directors and staff for their services.

Smaller Price and Bigger Revenue at Tonbridge.

The Directors of the Tonbridge Gas Company, in their report adopted at the annual meeting some days ago, stated that the result of the past year's working had been highly satisfactory; for, notwithstanding the reduction of 2d. per 1000 cubic feet in the price of gas, the revenue account showed an increase. The consumers had appreciated the concession made, and had responded by extending the use of gas for lighting, heating, and cooking. The reduction in the price to 2s. 6d. per 1000 cubic feet entitled the shareholders to an increase of ½ per cent. in their dividend on the "A," "B," "D," and "E" stocks. The revenue account showed a profit of £4227. After allowing for payment of interest on debenture stock, and the interim dividend, the profit and

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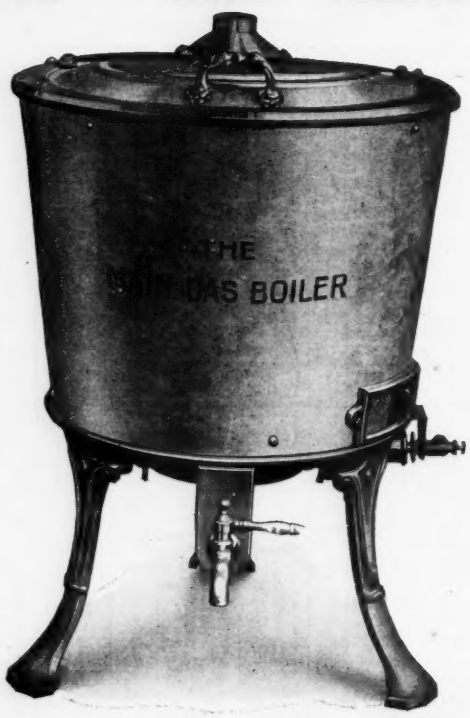

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8 Gallon
42s.

10 Gallon
45s.

12 Gallon
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Draw-Off Cock
6s. extra.

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loss account exhibited a balance of £6700, from which the Directors recommended the declaration of dividends for the half year to Dec. 31 at the following rates: 13 per cent. per annum on the "A" stock; 10 per cent. per annum on the "B," "D," and "E" stocks; and 5 per cent. per annum on the "C" stock. This would absorb £1887, leaving a balance of £4813 to be carried to the next account. The increase in the consumption was 4½ million cubic feet; the total output having now reached 107 millions. The Chairman (Mr. W. Judd) said that, at the new figure, Tonbridge supplied gas cheaper than any other town of similar size in the South of England. The preparation and disposal of tar had become a very important part of the Company's business; and practically the whole of the year's production had been purchased by the Kent County Council for use during the coming season. Mr. C. F. Catt, in returning thanks for his re-election as Auditor, remarked that he had been connected with the Company for eighteen years; and it was a great pleasure to him to be associated with such an enterprising Board of Directors, and such an able Secretary and Engineer as Mr. James Donaldson. He thought it would be of interest if he gave a few figures showing the growth of the Company, and the saving which had been effected since Mr. Donaldson came to Tonbridge in 1895. The capital in 1895 was £32,300; in 1909, it was £60,300. The capital per million in 1895 was £952; in 1909, £600. Dividends were then 10, 7, and 5 per cent.; they were now 13, 10, and 5 per cent. The receipts were £7520; they were now £18,697. The number of consumers in 1895 was 700; in 1909, 3210. The gas sold in 1895 was 34 millions; in 1909, over 100 millions. The price of gas in 1895 was 3s. 6d. per 1000 cubic feet; it was now 2s. 6d. He thought that few companies in the district could boast of having made such rapid progress. Under the sliding-scale clauses, from 70 to 80 per cent. of the benefit of any reduction went to the consumers; and the Company, by their practical and economical working, were saving the consumers of Tonbridge some £5000 per annum.

Extended Area and Reduced Price at Tunbridge Wells.

The Directors of the Tunbridge Wells Gas Company reported, at the forty-sixth annual meeting, held a few days ago, that the accounts for the year ended the 31st of December showed a profit, including the amount brought forward, of £20,828, out of which they recommended the declaration of dividends for the past six months at the rates of 12½, 10, and 9½ per cent. per annum on the several stocks of the Company. The payment of these would absorb £5765, after deduction of income-tax, and leave £15,063 to be carried forward. In response to a request for a supply of gas, the mains were being extended from Langton to Speldhurst. The Directors added that they had entered into a contract with Messrs. S. Cutler and Sons for reconstructing and adding two lifts to a single-lift gasholder, in order to convert it into a telescopic holder on the spiral-guided system. This will increase the storage capacity by 500,000 cubic feet. In moving the adoption of the report and accounts, the Chairman (Mr. W. H. Delves) said he thought the shareholders would agree with him that both were very satisfactory. The number of new consumers was just under 200 for the year. This was less than in the preceding twelve months; but the district was now pretty well covered. The Board, however, looked upon the new one to which they were going as promising an extension of business. The output of stoves in the year had been good; the number hired or sold amounting to 400. Referring to the increase in the storage, the Chairman explained that the proposed alteration of the existing gasholder was a very cheap method of obtaining it. He said it was 21 years since the last holder was erected, and with the tank it cost about £14,000. It held 680,000 cubic feet of gas. Now they would get an addition of 500,000 cubic feet for about £3100, which worked out at about £6 per 1000 cubic feet; and it was remarkably cheap. Having dealt with the various items of manufacture, the Chairman said that, after looking at the matter all round, the Directors had much pleasure in announcing a reduction of 1d. per 1000 cubic feet in the price of gas. This meant that the consumers would pay £1250 less for their gas, the employees would get £108 more for their bonus, and the shareholders would have just about £300. Thus 75 per cent. of the advantage went to the consumers, and the other 25 per cent. was divided between the employees and the shareholders. He thought this fully proved the assertion he had often made, that the shareholders, employees, and consumers were all partners in the same undertaking. The cheaper they could sell gas, the better it was for all concerned. The motion was carried without discussion. The four retiring Directors having been re-elected, the thanks of the proprietors were accorded to the Directors for the care and attention they had bestowed on the business of the Company during the year. The Chairman then submitted a vote of thanks to Messrs. Stone, Simpson, and Mason, the Solicitors to the Company, to Mr. A. Dougall, the Engineer and General Manager, to Mr. C. F. Catt, the Secretary, and other members of the staff, for their devotion to the interests of the Company. He mentioned that this year there was an increased bonus of 1 per cent. to the workmen, which was equal to three weeks' wages. Mr. Simpson made a brief response; and he was followed by Mr. Dougall and Mr. Catt, who replied on behalf of the engineering and office staffs. A vote of thanks to the Chairman concluded the business of the ordinary meeting. Subsequently a special meeting was held, at which the Gas Companies Standard Burner Bill received the approval of the shareholders.

Steady Growth of Business at Weymouth.

The accounts for the six months ending the 31st of December, which were presented at the half-yearly meeting of the Weymouth Gas Company, bore witness to the continued steady growth of the Company's business. The quantity of gas sold during the period named was 65,748,630 cubic feet, which was an increase of 2,166,800 cubic feet—3·4 per cent.—upon the output for the corresponding half of 19·8. During the past year, the sale was 122,676,300 cubic feet; this being 5,876,000 cubic feet—5·03 per cent.—in excess of the previous year. All items of receipts showed an increase, except that of coke. The

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at uncomplainable cost and

TO GAS AUTHORITIES a steady permanent consumption.

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1. **EASY FIXTURE**—to present Pipes.
2. **UTMOST EFFICIENCY**—Water absorbs 97½% of Heat Value of Gas.
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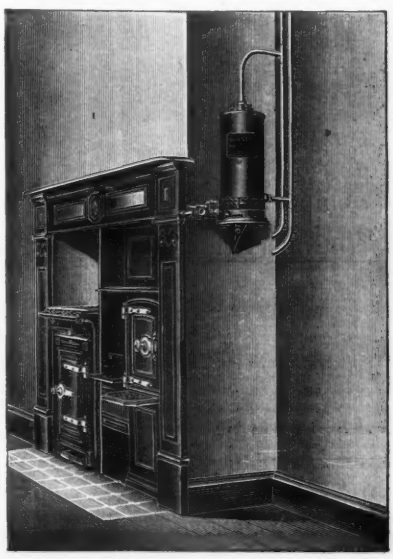
4. **GREAT DEMAND. THOUSANDS** in daily use, many constantly worked over 5 years and still going.



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decreased yield of this residual neutralized the whole of the increases; so that the total receipts were practically the same as in the second half of the year 1908. The profit made warranted the Directors, after paying the interest on the debenture stock, in recommending the declaration of a dividend for the half year on the ordinary stock at the maximum rate of 5 per cent. per annum, less income-tax. The Chairman of the Company (Mr. J. E. Robens) was unable, through ill-health, to be present; but he sent some remarks on the half-year's working of the Company, which were read by Mr. J. G. Rowe, the Vice-Chairman, who presided. After reviewing the position, Mr. Robens concluded as follows: "The entire income for the half year from all sources has been £13,308, and the expenditure, £11,048, which leaves a balance of £2260—sufficient to pay the 5 per cent. dividend we propose to declare. We have now finished the tenth year of the present century. During this period we have added 75 per cent. to our output, which is still continuing to advance, and our capital expenditure has been only 10 per cent. increased. The present year shows how steadily we are progressing, which must be a matter of congratulation to all connected with the Company, especially as during the time before mentioned we have reduced the price of gas from 3s. 8d. to 3s. per 1000 cubic feet." The report was adopted, and the dividend recommended declared. Thanks having been accorded to the Chairman and Directors, a similar compliment was paid to the Engineer and Manager (Mr. D. F. Colson), the Secretary and Accountant (Mr. E. Y. Wood), and the officials. The two gentlemen named were highly complimented on their work; and both expressed their appreciation of the remarks made in regard to them.

Incandescent Lighting at Brighouse.—Moving the adoption of the minutes of the Highways Committee at the monthly meeting of the Brighouse Town Council, Mr. Brown said the annual report from the Surveyor had been received as to the cost of street illumination for the last twelve months. At the end of the year 1905, the cost was £2953. Each year since the cost had been less; and last year the total cost of street lighting was £1557. This reduction in price was the result of using incandescent burners. The total cost of upkeep, maintenance, &c., in 1905 was £3492; whereas last year it was £2234—a saving of £1256.

Newport's Unsatisfactory Electric Undertaking.—The Newport (Mon.) electricity undertaking has, says a local paper, "given the Corporation some uneasiness." Over £9000 has, since its inauguration, been paid out of the rates to assist it; and the Committee therefore decided to call in an expert to advise them. Mr. C. P. Sparks was selected; and he has now presented his report, in which he recommends an all-round increase in the scale of charges. He points out that no reserve fund has been provided to meet replacements of plant which "may or has become obsolete before the expiration of the loan periods." Further, he cannot indicate any economies in the use of existing equipment.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Western District of the Scottish Junior Gas Association were favoured to-night with a paper by Mr. J. M. Smith, Joint Manager of the Dumfries Corporation Gas-Works, in which he gave a description of the construction and working of a sulphate plant which was erected in the works at Dumfries several years ago, when the late Mr. G. Malam was Engineer and Manager. The plant is a Wilton patent, with variations introduced at Mr. Malam's suggestion. It has all along worked most satisfactorily, and has been a source of great profit to the Corporation. Mr. Smith's paper was an excellent one. Notably he confined his remarks to the matter before the meeting, thereby narrowing the field of vision, and, as a consequence, the subject was discussed probably more sensibly than it would have been had the speakers had more ground to range over.

The shareholders of the Cupar Gas Company, Limited, at an extraordinary meeting the other day, unanimously resolved that the capital of the Company be augmented by the issue of 250 5 per cent. preference shares of £10 each, these shares to be offered to ordinary shareholders in proportion to their holdings, at a premium of 10s. per share; that the reserve fund be capitalized; and that the existing ordinary shares of the Company be augmented to £30 fully paid. The increase of capital is necessary on account of the Directors having resolved to put down sulphate plant.

At the monthly meeting last Monday of the Edinburgh and Leith Gas Commissioners, the report of the Engineer stated that in January there was an increased output of gas, over the preceding January, of 10¾ million cubic feet; and that since May 15 the increase had been 99,631,000 cubic feet, equal to 6·49 per cent. The Commissioners suspended their Standing Orders and agreed to a motion by Mr. J. Lyon that in the appointment of a Treasurer no age limit be fixed. This will necessitate the post being re-advertised. In the previous advertisement, it was required that applicants be not over 45 years of age. I understand that, under this provision, the list of applicants is not to the mind of some of the Commissioners—the post, at not less than £500 a year, not having been eagerly sought after.

The Chairmen of the two Houses of Parliament have advised the Secretary for Scotland, under section 2 of the Private Legislation Procedure (Scotland) Act, that the provisions of the Glasgow Gas Acts Consolidation Order are of such a character that they ought to be dealt with by way of Private Bill. As a result of this decision, the inquiry will take place at Westminster. The Corporation promoted the Order with a view to obtaining the repeal of the old Gas Acts, of which there are about twenty, and consolidating them into one measure. Mr. A. W. Myles, the Town Clerk, Mr. D. Stenhouse, the Deputy Town Clerk, and Mr. A. Wilson, the Gas Engineer, were in London on Wednesday adjusting proposed amendments to the Bill.

HIRING POINTS.

THE "NEW DAVIS" Cooker, the Screwless Cooker, the Cooker with unique features.

TO secure a large and permanent increase in your output of Gas, provide your consumers with A COOKER THEY CAN'T DO WITHOUT.

Such is the "New Davis."

Beauty of Design makes a good first impression; Economy, Simplicity, and Cleanliness make an irresistible appeal to the practical mind.

And for YOU there is Maintenance—always MAINTENANCE.

The Davis Gas Stove Co., Ltd., Luton.

The lectures on air purification which were promoted by the Glasgow Corporation Gas Committee were concluded this week; the last two having been given—by Mr. Alex. Wilson on Tuesday evening, and by Mr. W. M. Mason on Wednesday evening. Both lectures were largely re-deliveries of former ones.

It was reported to the Corporation of Glasgow this week that a Sub-Committee of the Gas Committee had attended a meeting in Edinburgh of the representatives of the municipalities appointed to watch over the interests of the Scottish gas undertakings in connection with the charges by the railway companies for demurrage and siding rents, when it was resolved that no application be made at this stage to the Board of Trade for the appointment of an arbiter in reference to these charges. The Chairman also reported that this resolution had been forwarded to the Board of Trade and to the railway companies interested, with an intimation that the municipalities reserved all their rights to apply at a later stage for the appointment of an arbiter, and that they were not to be prejudiced in any way by adopting the foregoing course, or by any decision which might be pronounced in the arbitrations now pending before the Railway and Canal Commissioners with reference to the charges. This course was approved. The hearing before the Railway and Canal Commissioners of the traders' and coalowners' cases is to take place in Edinburgh at the beginning of May, and is likely to be of a protracted nature.

The engineer in charge of the extensions to the Kirkcudbright Corporation Gas-Works—Mr W. B. M'Lusky—has reported the completion of the work. The estimate was £1605; the cost has been £1593.

The fourteenth annual meeting of the Larkhall Gas Company, Limited, was held at the end of last week—Mr. A. Hamilton, the Chairman of the Company, presiding. The net available balance for appropriation was reported to amount to £1486. Out of this, the Directors recommended that £893 be set apart for payment of a dividend of 10 per cent., that £100 be placed to the reserve fund, and that the balance of £493 be carried forward. This was agreed to.

The works of the Aberlady Gas Company, which are managed by Mr. H. Rutherford, have been almost entirely renewed, under the direction of, and to plans prepared by, Mr. H. O'Connor, F.R.S.E., of Edinburgh. The new works consisted of the erection of a retort-house, containing two arches, designed for three retorts each, but at present only one arch with two retorts and one arch with one retort are to be utilized, the firing to be on the regenerative principle (introduced for the first time), the old retort-house converted into a coal-store, air condensers, a Young scrubber, two purifiers with rubber joints, governor, lime-shed, meter-house with station meter of 4000 cubic feet per hour capacity, underground tar-tank with pump, and a gasholder of 25 feet diameter, with steel tank. The only part of the old works which has been retained is a gasholder of 20 feet diameter. The cost of the work has been about £1100, to provide which the capital of the Company has been increased. The gasholder was provided by Messrs. Henry Balfour and Co., Limited, of Leven; and the purifiers, meter, and governor by Messrs. Jas. Milne and Son, Limited, of Edinburgh.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 5.

Sulphate of Ammonia.

Further direct orders for shipment this month having come into the market, and dealers having evidently decided not to delay any longer the covering of their March requirements, there has been resumed activity the last few days, and higher prices have been paid. At the close, the tone is very firm, and the values are £12 to £12 1s. 3d. per ton f.o.b. Hull, £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Liverpool, and £12 5s. to £12 6s. 3d. per ton f.o.b. Leith. There is rather more demand for home consumption, but it is still on a comparatively small scale. In the former position, further transactions are reported at £11 15s. per ton f.o.b. Leith for delivery over the second half of this year. Makers have now advanced their quotation for this period to £11 17s. 6d. per ton, but no business has transpired at the latter figure.

Nitrate of Soda.

This continues without change, and spot quotations are maintained at 9s. 3d. per cwt. for ordinary, and 9s. 6d. for refined quality.

LONDON, *March* 7.

Tar Products.

The markets for tar products have been firm during the past week. Pitch has been steady, with a tendency to improve. Creosote maintains its position; and makers are hopeful that there will be an improvement in price after the heavy make of tar has been disposed of. Benzol is very firm indeed, especially for delivery to the end of June. Fifty-ninety per cent. is scarce, and is fetching good prices. Toluol is also in good demand; while for solvent naphtha the market is still showing signs of improvement. Carbolic acid is steady, but crystals are still neglected. Liquid carbolic is firm. Anthracene is unchanged; and tar is fetching good prices.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. *ex* works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. to 31s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7⅞d.; North, 7¾d.; 50-90 per cent., casks included, London and North, 8d. to 8¼d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4¼d.; solvent naphtha, casks included, London, 1s. 2½d. to 1s. 3½d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11½d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2½d. to 2¼d. Heavy oils, in bulk, 2¼d. Carbolic acid, 60 per cent., east and west coasts, 1s. 0¼d. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market is still very firm, though buying has not been quite so brisk. To-day actual Beckton are asking £12 5s.; and outside makes upon Beckton terms are £12. In Hull, the price is £12; in Liverpool, £12 to £12 1s. 3d.; in Leith, £12 5s.; and in Middlesbrough, £12.

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COAL TRADE REPORTS.

Northern Coal Trade.

There is a steady demand for coal in the North, and the output is still kept a little below the normal by the idleness of a few collieries. In steam coals, the inquiry is fuller, and the prices are a little higher than a week ago. Best Northumbrian steams are from 11s. 3d. to 11s. 4½d. per ton f.o.b.; second-class steams are about 10s. 3d.; and steam smalls are 5s. 9d. to 6s. 9d., according to quality. Work at the collieries is fair, but there is still some uncertainty as to future working. In gas coals, the output is maintained, and prices are generally firm. The usual kinds of Durham gas coals are from 10s. 4d. to 11s. per ton f.o.b., according to class, and "Wear" specials are from 11s. 6d. to 11s. 9d. As to contracts, there are one or two small ones concluded tat something like the prices that are current, and some larger ones are expected to be soon put on the market. As there is a tendency o stiffness in the prices, and one or two collieries are idle, these more distant contracts are still in doubt, and collieries do not readily take up fresh sales unless at relatively good prices. Coke is firm, with gas coke from 14s. to 14s. 3d. per ton f.o.b.

Scotch Coal Trade.

Trade was better last week, the demand for all classes of coal having improved. Shipping trade was brisk, with better prospects than for some time. The prices quoted are: Ell, 9s. 9d. to 10s. 6d. per ton, f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 289,285 tons—an increase of 14,542 tons upon the preceding week, and of 24,936 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,196,108 tons—an increase of 375,607 tons upon the corresponding period.

In the report to be presented by the Directors of the Richmond Gas Stove and Meter Company, Limited, at the nineteenth ordinary general meeting on Thursday, they state that the balance standing to the credit of the profit and loss account for the past year (after deducting debenture interest, but including the amount brought forward) is £24,767, which it is recommended should be appropriated as follows: Depreciation in buildings, plant, &c., £5776; dividend on preference capital at the rate of 6 per cent. per annum, £5893; dividend at the rate of 10 per cent. per annum (free of income-tax), £8068—leaving, in round numbers, £5030 to be carried forward, subject to the Directors' remuneration. The Directors announce that, owing to the increase in the business, new fitting-shops are being erected at their works at Grappenhall. Further extensions are also being made to the Company's laboratories, which, they say, will make them one of the most up-to-date in the country. They also mention the acquisition of the Clark's Syphon Stove Company—a business which has been established upwards of twenty years.

An Unsuccessful Compensation Claim.

Last Thursday, at Crewe, Judge Brown, K.C., had before him an application by the widow of a London and North-Western Railway gas-fitter for £217 compensation for the loss of her husband, Samuel Dean, who, it was alleged, died from gassing while following his employment. He was fitting a gas-meter; and in testing it a slight explosion occurred, due, according to the applicant, to a defective gas-pipe supplied by his employers. He died a week later. On behalf of Mrs. Dean, two doctors attributed death to cerebral hemorrhage caused by carbon monoxide poisoning; but the Railway Company's surgeon, who was present at the postmortem, attributed death to natural causes. It was also contended by the respondents that if the deceased was gassed it was not an injury by accident, inasmuch as gasmen must necessarily inhale gas. It was an incident of their employment. The Judge agreed that the deceased in a sense was gassed; but if death was the result of that, he would have expected hemorrhage immediately, whereas it did not occur until three days afterwards. Gassing undoubtedly might cause congestion of the brain, and congestion might cause the arteries to give way; but, in his opinion, all appearances in the case were equally consistent with the deceased having died from natural causes. He refused the application.

Sales of Stocks and Shares.—There was a large gathering of investors at the Mart, Tokenhouse Yard, E.C., on the occasion of the sale by Messrs. A. & W. Richards of a new issue of stock of the South Essex Water Company. The Directors offered £5000 of 5 per cent. ordinary (1901) stock, £10,000 of 5 per cent. preference stock, and £5000 of 4 per cent. perpetual debenture stock. The ordinary stock, on which £4 17s. 6d. per cent. is being paid, all sold at £115 10s. to £116 10s., the 5 per cent. preference stock at £125 to £126 10s., and some of the debenture stock at £109 per £100. The sale of the Hornsey gas stock, which was to have taken place on the same day, is postponed till the 22nd inst. At a recent sale by auction, ordinary £10 shares in the Gosport Gas Company fetched from £12 5s. to £12 10s. each.

Quality of Eastbourne Gas.—The Lighting Committee of the Eastbourne Corporation have received a letter from the Secretary of the Gas Company (Mr. J. S. Garrard) stating that his Directors are no less anxious than the Committee that the heating quality of the Company's gas should be maintained, and that they will spare no expense or trouble to maintain at the highest practicable level the quality of gas for all purposes. With reference to the results of the calorific tests made during the month of December last, the Directors cannot recognize such tests as proving conclusively that since the passing of the Company's new Act there has been a lowering of the standard. They are advised that the test should cover a long period; and, in fact, that no definite comparison of one year as against another can possibly be made until the tests for the year following the passing of the Act have been recorded.

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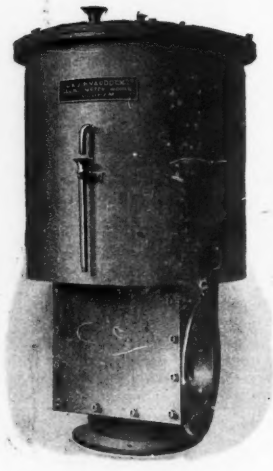
ARE UP-TO-DATE AND RELIABLE.



SECOND TO NONE.

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Telegrams: "METRIQUE, LONDON." Telephone No. 2412 HOP.

A Serious Charge Dismissed.

At the Marylebone Police Court, last Saturday, the investigation was concluded by Mr. Plowden of charges brought by the Gaslight and Coke Company against Arthur Percival Jemmett, for ten years a clerk at their branch office at Kilburn, of stealing two postal orders for £1 3s. 8d., and obtaining this amount by forging and uttering them. The previous proceedings were noticed a fortnight ago (p. 515). Mr. Humphreys, solicitor, prosecuted. Mr. H. H. Curtis Bennett, who defended, said the prisoner denied absolutely that he had anything whatever to do with any one of the postal orders, and he was in a position to prove that it was utterly impossible for him to have cashed the two orders as alleged by the postal clerk. Evidence was then given that the orders did not reach the Company's office until about two o'clock, the time before which they were said to have been cashed by Jemmett at a post office a third of a mile away. The accused also denied the charges on oath, and said he did not even know of the existence of the post office until after these proceedings had been taken. The Magistrate remarked that it was eminently a case that called for inquiry, for naturally some suspicion attached to the prisoner; but in view of the evidence, and the very high character the accused bore, he could not conceive that any jury would convict. He therefore took upon himself the responsibility of discharging the prisoner.

Shanklin Water Supply.—The Local Government Board have approved of the plans submitted to them by the Shanklin Urban District Council for the Chillerton water scheme, by which a much more liberal supply of water will be provided for the town than that which is now available.

Prepayment Installations at Hereford.—One of the items in the Gas Committee's report submitted at the last monthly meeting of the Hereford Town Council had reference to the supply of gas-pendants to slot-meter consumers. It was as follows: "In consequence of the gas-pendant now in use being unsuitable for incandescent burners and mantles, the Committee have decided, on the recommendation of the Gas Manager (Mr. W. W. Townsend), to fix free of cost an improved type of pendant with incandescent burner and mantle in the houses of slot-meter consumers who use over £2 worth of gas per annum—such houses being, in the opinion of the Manager, otherwise suitable. The cost of each pendant, including burner and fixing, is 6s. The Committee fully expect that this additional concession to consumers will be much appreciated, and result in additional revenue." In answer to a question, the Chairman of the Committee said about half the number of consumers used £2 worth of gas a year. The proposal represented a considerable concession to the poorest consumers. One of the town councillors remarked that he thought the Committee deserved the congratulations of the Council upon the enterprising way in which they were meeting the small consumers and benefiting them. The report was adopted.

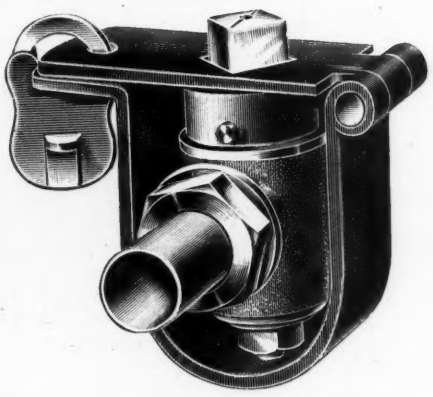
Proposed Extension of the Devonport Gas-Works.—It was decided by the Devonport Corporation Gas Committee last week to apply to the Local Government Board for a loan of £6000 for extensions at the gas-works, to increase the output of gas. The decision will require the confirmation of the Town Council; and the matter will come before that body this week.

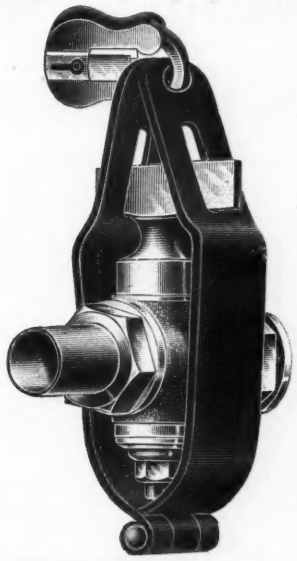
Reductions in Price.—The Exeter Gas Company have reduced the price of gas 2d. per 1000 cubic feet for general purposes, and have taken 1d. per 1000 cubic feet off the prices now charged for gas used for motive power. The Directors of the Tunbridge Wells Gas Company have reduced the price of gas 1d. per 1000 cubic feet; making it 2s. 7d. within the borough.

Colliery Workings under Audenshaw Reservoirs.—At the meeting of the Manchester City Council last Wednesday, the Water Committee reported, with reference to the colliery workings beneath and adjacent to the Audenshaw reservoirs, that they had conferred with the representatives of the New Moss Colliery, Limited, and had come to an arrangement by which the Corporation purchase from the Company and Lord Stamford the coal for the sum of £35,000. This includes all mines and minerals under the reservoirs not already vested in the Corporation, and also those under Lord Stamford's land surrounding the reservoirs which have to be left as support to the reservoirs and adjoining lands of the Corporation. The Colliery Company agree to pay to the Corporation £6000 in lieu of taxed costs. This, together with £11,667 unpaid balance of damages, will be deducted from the £35,000, and leave £17,333 to be paid to the Colliery Company—thus putting an end to prolonged litigation.

Penistone Gas Purchase Question.—A large meeting of ratepayers assembled at Penistone last Saturday week to further consider the question of the proposed purchase of the undertaking of the Penistone, Thurlstone, and Oxspring Gas Company, for the sum of £19,800. A good deal of opposition to the proposal was manifested; and ultimately a resolution was passed that in the opinion of the meeting the Council should suspend all action in reference to the purchase of the gas undertaking until the possibility of the Yorkshire Electric Power Company supplying electricity to Penistone had been fairly investigated. Mr. W. Newbigging, of Manchester, who had been called in to advise the Council, attended the meeting and gave his reasons for recommending the purchase. He said that when he examined the balance-sheet of the Gas Company, it occurred to him that it was a pity the Council had not moved in the matter a few years ago. The Company had considerably developed; and their profits had increased enormously—jumping up from £932 in 1907 to £1049 in 1909. The payment of the purchase price of £19,800 was to extend over a period of forty years; and he was confident that at the end of this period they would have the undertaking free from debt, unless they had to make extensions because of increased demand. He was satisfied that there would be no call upon the rates. The maintainable profits of the undertaking were more than sufficient to meet interest and sinking fund, and would leave a small balance of profit.

NEWBIGGING'S PATENT TAP FASTENER.





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Gale's Harvest of Broken Incandescent Mantles.—From a report presented to the Rochdale Corporation Gas Committee last Wednesday, the gale which swept over the district on Feb. 17 and succeeding days played sad havoc with the incandescent mantles in the street-lamps. On Feb. 17, over 800 mantles were wrecked; and the high wind prevailing on succeeding days accounted for 400 more. It was stated that the cost of the new mantles would be over £13.

Concession to Chard Gas Consumers.—At the meeting of the Chard Town Council last week, the Gas Committee reported their ability to allow a further discount of 2½ per cent. to consumers of gas through ordinary meters, and a rebate of 1d. per 1000 cubic feet to users of prepayment meters consuming 10,000 cubic feet and upwards per annum. This concession, it was stated by Mr. A. E. Townsend, the Chairman of the Committee, was made possible by the surplus on the running of the undertaking last year. He looked foward to a further surplus at the end of next year, which would enable them to reduce the price again. It was explained that the average consumption in prepayment meters was 12,000 cubic feet.

The Hemsworth, Grimethorpe, and District Gas Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, for a new steel coal-store, complete with coal elevator and conveyor.

The "Iron and Coal Trades Review" states that the Gas Coal Collieries, Limited, of Cardiff, who, a few months ago, took over Messrs. Robert Davies and Co.'s colliery, near Llanharran, are now working the colliery.

The friends of Mr. George Hands will, with us, be pleased to learn that, after a very serious illness of four months' duration, he has so far recovered as to be able to attend at his business premises in Farringdon Road for a few hours daily.

The first batch of letters of allotment and regret in respect of the Trinidad Oilfields, Limited, which was advertised in the "JOURNAL" last week, has been posted. The "Financial News" states that the issue was many times over-subscribed.

The contract for the whole of the cooking apparatus of the new General Post Office—King Edward's Building, London—has been placed by His Majesty's Office of Works with Messrs. R. & A. Main, Limited, of Falkirk, Glasgow, and London.

A verdict of "Suicide during temporary insanity" was returned by a Coroner's Jury at Kingston-on-Thames who inquired into the death of Danewood Fiveash, an insurance agent. Deceased was found dead at his residence with his head in a gas-oven. He had been bound over to give evidence against a man at the Surrey Assizes.

It may be remembered that the Tottenham and Edmonton Gas Company recently advertised in our columns a sale of £30,000 of "B" stock to be issued at a minimum price of £111. We learn that tenders were received for £90,595, at prices ranging from the minimum to £116. The average price obtained for the stock was £112 9s. 1d.

The Directors of Stewarts and Lloyds, Limited, have decided to pay dividends of 10 per cent. per annum on the preferred ordinary shares and of 1s. per share on the deferred shares for the half year ended Dec. 31 last, after setting aside £70,000 for depreciation, and placing £30,000 to the reserve fund; leaving a balance of £81,000 to be carried forward.

The Manchester City Council, at last Wednesday's meeting, appointed a Special Committee to consider the applications for advances of salary presented by the Gas, Water, and other Committees on behalf of officials engaged in the different departments. The Committee have to present a report on the subject within three months. It is understood that the members of the Special Committee, who held a meeting last Friday, favour a scheme framed on the lines of Civil Service methods.

A serious fire broke out early last Thursday morning at the Birmingham Gas Lamp and Fitting Company's works in Dudley Road, Birmingham. The damage, which will run into a considerable sum, was chiefly occasioned by the destruction of gas and lamp fittings and a quantity of machinery. Last Tuesday, the extensive premises of Messrs. Johnson and Phillips, Limited, electrical engineers, in the Victoria Road, Charlton, were the scene of an alarming conflagration, which it is estimated will result in a very heavy loss.

At a meeting of the Tredegar Urban District Council, a deputation was received representing the licensed victuallers of the town, who asked for an abatement in their gas bills owing to a failure of the supply. It was pointed out that if the licensed victuallers pressed their claims, all other consumers would have to be similarly treated, and this would entail a very heavy drain on the finances of the Council. The deputation hinted that, unless their application for abatement was conceded, they would have to consider the question of providing their own light.

At the meeting of John Wright and Eagle Range, Limited, next Thursday, the Directors will report that the balance on the revenue account for the year ended Dec. 31, after augmenting the contingent reserve and charging Directors' fees, Managing-Directors' remuneration, and depreciation on the buildings and plant, amounts to £55,052. After adding the balance (£8785) brought forward, and deducting the interim dividends (£17,936) paid in August last, there remains for disposal the sum of £45,900, which the Directors recommend should be appropriated as follows: Payment of a dividend at the rate of 6 per cent. per annum for the half year on the preference shares, less income-tax, £2401; dividend of 2s. 6d. per share on the ordinary shares, free of income-tax, £25,875; to the reserve fund, £8000; to be carried forward, £9624. The Directors report with much regret that Mr. J. F. Wright, finding it necessary to limit his business engagements, has resigned his position as a Director, and does not offer himself for re-election. The shareholders will be invited to vote a sum of £250 to Mr. Wright, in acknowledgment of his long and valuable connection with the Company.

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At the next meeting of the British Gaslight Company, the Directors will recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share (both free of income-tax), for the half year ended Dec. 31 last.

In a report on the work of the Middlesex County Council, during the past three years, the Chairman says the gas-meter testing-station at Edmonton, which was opened in July, 1900, continues in a satisfactory condition. The number of meters tested in 1908-9, was 82,558; and the fees earned amounted to £2497. The net profit derived by the Council from the station during the last three years amounts to about £2849. The total number of meters tested since the station has been in existence is 679,051; and fees amounting to £20,563 were received. The net profit to the Council during this time has been £8659.

Alluding to the question of filling up the vacant secretaryship of the Birmingham Corporation Gas Department, a local paper says: "There are plenty of good business men to be found, but unfortunately they cannot claim any practical knowledge of the making and distribution of gas; while, on the other hand, there are gas engineers of repute who might be induced to come to Birmingham, but they are without the commercial acquaintance which is an essential quality of the secretaryship. It is realized that Mr. Hampton Barber united these merits in such a successful degree that he is a difficult man to follow. The work of the department is proceeding very satisfactorily under existing arrangements; and this knowledge relieves the Sub-Committee of undue haste in finding a man whose appointment they can recommend. They will therefore proceed prudently and cautiously, in the hope of ultimately selecting the most capable man available."

The employees of the Grimsby Gas Company have lately formed a social and recreation club; and the Directors have assisted the movement by placing at their disposal a large room, formerly used as a showroom, for the meetings, and providing the furniture for it. The President is Mr. John Terrace, the Manager of the Company, and his Assistant (Mr. J. Sayner) is Vice-President; Messrs. J. Kennington and A. Whitworth being the Secretary and the Treasurer. The room was opened for the first time on the 25th ult. with a tea and smoking concert. Mr. Terrace presided, and gave a brief address during an interval in the programme. He asked for the personal interest of each employee in the work of the Company, and urged them all to do their best to make the club a success. These remarks were emphasized by Mr. Sayner in proposing a vote of thanks to the Board for the support they had given to the club; and the vote was heartily accorded.

APPLICATIONS FOR LETTERS PATENT.

4293.—Anderson, D., and Worsfold, J., "Supply of combustible in gas-lamps." Feb. 21.

4327.—Dobson, E., "Gas-pressure regulators." Feb. 21.

4363.—Bone, W. A., Wilson, J. W., and M'Court, C. D., "Transferring heat from gases to liquids or gases." Feb. 22.

4364.—Bone, W. A., Wilson, J. W., and M'Court, C. D., "Burner for welding." Feb. 22.

4372.—Duff, A. B., and Gas Power and Bye-Products Company, Limited, "Recovery of ammonia from producer gas." Feb. 22.

4407.—Hanwell, H. W., "Gas-fittings." Feb. 22.

4438.—Jackson, T., "Gas-lighted flash-signs." Feb. 22.

4439.—Brown, T. W., and Tilley, F. C., "Gas-lamps." Feb. 22.

4430.—Williamson, H., "Incandescent lighting." Feb. 22.

4468.—Prangnell, N. W., "Street-lamps." Feb. 23.

4473.—Fabry, R., "Recovering ammonium sulphate direct from coke-oven or retort gas." Feb. 23.

4482.—Leach, S. H., Lang, A. M'A., and Fawcett, Preston, and Co., Limited, "Manufacture of heating gas." Feb. 23.

4490.—Fletcher, Russell, and Co., Limited, and Fletcher, T. W., "Blast-tube burners." Feb. 23.

4543.—Davis, G. K., "Gas-washers." Feb. 23.

4612.—O'Neill, W. P., "Petrol air-gas lighting." Feb. 24.

4613.—Sadler, H. S., and Ashmore, Benson, Pease, and Co., Limited, "Purification of gas." Feb. 24.

4621.—Burstall, F. W., "Extracting tar and other impurities from gases." Feb. 24.

4627.—Gas-Laternen-Fernzündung, System Rostin, G. m. b. H., "Gas-lighting apparatus." Feb. 24.

4723.—O'Callaghan, P. B., "Protecting and conserving mantles, and increasing the illuminating power of gas." Feb. 25.

4792.—Ham, F. G. S., "Union ferrule for insertion into mains under pressure." Feb. 25.

4889.—St. John, L. M., "Gas-saver." Feb. 26.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

Travellers (Coal). No. 5200.
Representative (Chandeliers). No. 5201.
Working Tinshop Foreman. No. 5202.

Situations Wanted.

Assistant-Manager or Head Foreman (Coke-Ovens). No. 5187.
Engineer's Assistant. No. 5203.
Manager, Superintendent, &c. No. 5204.
Saturator Maker and Repairer. Leadburner, 117. Gallaway Road, Shepherd's Bush.

Capital Wanted by Syndicate. No. 5196.

Plant, &c. (Second Hand), for Sale.

Saturator. No. 5194.
Washer for Ammonia Recovery, &c. Powell Duffryn Steam Coal Company, Aberaman.

Business for Disposal.

Anti-Vibration Incandescent Lighting Company.

Meeting.

British Gaslight Company. London Offices, March 23, Twelve o'clock.

Stocks and Shares.

Bournemouth Gas and Water Company. March 17.
Eastbourne Gas Company. March 12.
Gaslight and Coke Company. March 15.
Hornsey Gas Company. March 22.
Mitcham and Wimbledon Gas Company. March 15.
Romford Gas and Coke Company. March 15.
Sevenoaks Water Company. March 15.
South African Lighting Association. No. 5199.
Wandsworth and Putney Gas Company. March 15.

TENDERS FOR

Coke.

Wandsworth and Putney Gas Company. Tenders by March 18.

Fire-Clay Goods, &c.

Audley Urban District Council. Tenders by March 15.
Stockport Gas Department. Tenders by March 15.

General Stores—

(Brass and Meter Fittings, Bolts and Nuts, Iron and Steel, Ironmongery, Oils, Paints, Tools, Drysaltery, Lime, Brushes, Glass, &c., &c.)
Stockport Gas Department. Tenders by March 15.

Meters.

Leeds Gas Department. Tenders by March 19.
Stockport Gas Department. Tenders by March 15.

Pipes, &c.

Leeds Gas Department. Tenders by March 19.
Stockport Gas Department. Tenders by March 15.

Retort-Benches.

Audley Urban District Council. Tenders by March 15.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
Palmerston House,
Old Broad Street, London, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
Andrew Stephenson, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, Oldham, and 54 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
Repairs receive prompt attention.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
"Braddock, Oldham," and "Metrique, London."

OXIDE OF IRON (BOG ORE).
ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
110, CANNON STREET, LONDON.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers, Works: Birmingham, Leeds, Wakefield, and Sunderland.

"V.S.C." PAINT FOR GAS-WORKS PLANT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "Enamel." National Telephone 1759.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, Crooked Lane, London, E.

SULPHURIC ACID.
SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.
with which is amalgamated Wm. Pearce & Sons, Ltd.
86, Mark Lane, London, E.C. Works: Silvertown.
Telegrams: "Hydrochloric, London."
Telephone: 341 Avenue.

AMMONIACAL Liquor wanted.
Brotherton and Co., Ltd., Ammonia Distillers, Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.
For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

BROTHERTON & CO., LIMITED. Offices: City Chambers, LEEDS. Correspondence invited.

W. EDGAR,
GAS APPARATUS MANUFACTURER.
BLENHEIM WORKS, HAMMERSMITH, LONDON, W.
Telegrams: "GASOSO LONDON." Telephone: 14 HAMMERSMITH.

ORDERS BY TELEGRAPH
REQUIRE prompt delivery, and should be addressed
MILNE EDINBURGH,
MILNE LEEDS,
MILNE LONDON,
GASLIGHTS GLASGOW,
Large Stock of METERS and GAS FITTINGS.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DAYLIGHT LONDON." Telephone: 2836 HOLBORN.

AMMONIACAL Liquor wanted. CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS. Telegrams: "CHEMICALS."

SULPHURIC ACID.
SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

METER INDICES
WITH AND WITHOUT DIALS.
A. ROUX & CO., Limited,
9, SOUTHAMPTON STREET, HOLBORN, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

HIGH PRESSURE PLANT COMPLETE.
JAMES MILNE AND SON, LIMITED, will have pleasure in submitting Prices and Specifications for large or small Schemes.
MILTON HOUSE WORKS, EDINBURGH.
MIDLAND METER WORKS, LEEDS.
111, St. Vincent Street, GLASGOW,
59, Farringdon Road, LONDON.

BRISTOL RECORDING GAUGES AND THERMOMETERS.
J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIA. Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

LUX'S GAS PURIFYING MASS. See Advertisement on p. 690.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

KRAMERS AND AARTS WATER-GAS PLANT.
K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 1, p. 277.

OXIDE OF IRON FOR GAS PURIFICATION.
Please Address Inquiries for Analysis and Prices to the
NEW WESTBURY IRON COMPANY, LTD.
WESTBURY, WILTS.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GEO. NEWTON, Limited,
Wires: "AUTOMATIC, MANCHESTER."
40 YEARS' REPUTATION.
WET, DRY, ORDINARY and PREPAYMENT, STATION METERS, &c.
Late of Oldham—Note *new* Address:—
39, RIVER STREET, HULME, MANCHESTER.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.
UNDERWOOD HOUSE, PAISLEY.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

SATURATORS made or Repaired. Reasonable Terms (workmanship guaranteed) by a 30 Years' Saturator Maker (Labour and Plant only), at per Hour and Rail. Saturators improved, Saving 10 to 20 per Cent of Ammonia. Perfect Mixing and Noiseless. Late of Beckton.
LEADBURNER, 117, Gallaway Road, SHEPHERD'S BUSH, W.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

LITLE'S PATENT INVERTED GAS-BURNER.
THERMOSTATIC regulation of Air and Gas prevents Flashbacks and Carbonization, and insures highest Candle-Power efficiency.
THOMAS J. LITLE, Junr., Inventor, Bush Lane House, Cannon Street, LONDON.

APPLICATIONS FOR APPOINTMENTS.
DO you appreciate how much success depends on well-considered and lucid presentment of your qualifications? I make a Specialty of the Preparation of Applications, and am continually receiving complimentary letters from clients. Write now for Particulars.
HERBERT GREATOREX, HACKNEY, MATLOCK.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

ECONOMY and Efficiency can be ob- tained by installing one of
MILNE'S PRESSURE REDUCING GOVERNORS in your Hilly Districts. No Trouble. No Consumers' Complaints. Pressure Automatically Controlled.
JAMES MILNE AND SON, LIMITED,
EDINBURGH, LEEDS, LONDON, GLASGOW.

GAS Engineer's Assistant seeks vacancy. Works or General. Excellent Qualifications and Experience in Works, District, and Office. Chemist and Draughtsman.
Address No. 5203, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BYE-PRODUCT COKE-OVENS.
WORKING Manager is desirous of a SITUATION. Would accept place as ASSISTANT-MANAGER or HEAD FOREMAN. Good References.
Address No. 5187, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED by Advertiser (Age 26)—of good inventive ability, who has had Six Years Experience in a large London Gas Company; also good Commercial Training—position as MANAGER, SUPERINTENDENT, or any POSITION of RESPONSIBILITY. Good Prospects more Important than Commencing Salary. Excellent References (London preferred).
Address No. 5204, care of Mr. King, 11, Bolt Court FLEET STREET, E.C.

WANTED, Two or Three Good Men to call upon Gas Companies FOR SALE of COAL and CANNEL for Factors. Must have had Experience as Salesmen to Gas Companies. State Locality best known.

Apply, by letter only, to No. 5200, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHANDELIER TRADE—Representative wanted, with First-Class Gas Company Connection, London and South Coast, by an Old Established Birmingham Firm manufacturing Fancy and Slot Gas Fittings.

Apply, by letter only, to No. 5201, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS ENGINEERS.

WANTED, several Gentlemen having Influence in the Gas Industry to JOIN SYNDICATE being promoted for Further Developing Valuable Patents which are already on the Market and paying Excellent Profits. Minimum Qualification, £500.

Apply, by letter, to No. 5196, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED by a large Municipal Gas Undertaking, a thoroughly Competent and Practical Working TINSHOP FOREMAN. None but those who have had considerable Practical and Up-to-Date Experience in the Manufacture, Repair, and Testing of Wet and Dry Meters will be entertained.

Applications (which will be treated as strictly confidential) stating Age, Experience, and Wages required, to be accompanied by *copies* only of Testimonials, to be addressed to No. 5202, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., not later than March, 19, 1910.

CAST-IRON Pipes. Spigot and Socket or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.

A. LOWCOCK, Limited, SHREWSBURY.

GASHOLDERS—Splendid 45 feet diameter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR SALE—One Three-Ton Leaden SATURATOR, including all Pipe Connections, open Type. Suitable either for Hand Fishing or for Wilton's Ejector. Strongly built and in good Condition. Has been only little used. Can be inspected.

Address No. 5194, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One "Wilton's" Patent Washer, for Ammonia Recovery, in Six Sections, each Section Complete, with Four Bubbling Trays and Hoods, Inlet and Outlet Valves, and with 20-inch Connections. Also the necessary Seal-pots and Liquor Connections.

For further Particulars, Apply to the POWELL DUFFRYN STEAM COAL COMPANY, LIMITED, Stores Department, Aberaman, near ABERDARE.

THE ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED.

IN VOLUNTARY LIQUIDATION.

THIS well-known and Established business of Gas Lighting Engineers and Makers of Greenall's Positive Measurement Meter, as at present carried on at the Albion Works, Otley, is now OFFERED AS A GOING CONCERN, with all Plant and Machinery, Patterns, Patents and Goodwill.

The Works were re-arranged Five Years ago, by the Company, and are admirably adapted for their purposes, consisting of a large, very well-lighted shed, with extensive Offices, Storeroom, and Lavatories, with small Iron and Brass Foundries attached, the whole covering an area of 9000 sq. yards, and can be obtained at a moderate rental.

Apply to the LIQUIDATOR, Albion Works, OTLEY.

AUDLEY URBAN DISTRICT COUNCIL.

GAS-WORKS.

THE above Council invite Tenders for the RE-CONSTRUCTION of TWO BENCHES of RETORTS.

Further Particulars and Specifications, &c., can be obtained on Application to the Gas Manager, Gas-Works, Audley.

Tenders, endorsed "Retorts," to be sent to the undersigned not later than the 15th inst.

JOHN J. NELSON,
Clerk to the Council.

Kidsgrove, Staffs,
March 4, 1910.

LEEDS CORPORATION GAS-WORKS.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the Supply of WROUGHT-IRON TUBES and FITTINGS.

Forms of Tender may be obtained on Application to the undersigned.

Sealed Tenders to be delivered not later than Saturday the 19th inst., addressed to the Town Clerk, Town Hall, Leeds, and endorsed "Tender for Wrought-Iron Tubes."

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, East Parade,
Leeds, March 5, 1910.

LEEDS CORPORATION GAS-WORKS.

TENDERS FOR DRY GAS-METERS.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the Supply of DRY GAS-METERS, Ordinary and Prepayment, to be delivered at their Meter Stores during a period of Twelve Months from receipt of Order.

Each Party Tendering is required to send on or before Saturday, the 12th inst., Two Sample Five-Light Ordinary Meters, and Two Sample Three-Light Prepayment Meters (one in each case to be left open for Examination), addressed to the Gas-Meter Department, Meadow Lane, Leeds.

Form of Tender may be obtained an Application to the undersigned.

Sealed Tenders to be delivered not later than Saturday, the 19th inst., addressed to the Town Clerk, Town Hall, Leeds, and endorsed "Tender for Gas-Meters."

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, East Parade,
Leeds, March 5, 1910.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 8000 Tons of Guaranteed "Wandsworth" COKE from their Works at Wandsworth, between April 1 and Sept. 30 next.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than March 18.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.

Wandsworth and Putney Gaslight and
Coke Company, Fairfield Street,
Wandsworth, S.W., March 5, 1910.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

TENDERS FOR STORES.

THE Gas Committee are prepared to receive TENDERS for the Supply of GENERAL STORES for One Year from April 1, 1910, to March 31, 1911.

1—Bolts and Nuts.
2—Brushes.
3—Brass and Meter Fittings.
4—Cartage.
5—Iron Castings.
6—Drysaltery.
7—Retorts and Fire Goods.
8—Glass and Putty.
9—Iron and Steel.
10—Ironmongery.
11—Mill Furnishing.
12—Oils and Grease.
13—Tarred and Spun Yarn.
14—Shovels, Pick Heads, &c.
15—Timber, English and Foreign.
16—Tubing.
17—Wet and Dry Ordinary Meters.
18—Lime.

Forms of Tender and all further Information may be obtained on Application to the Engineer, Gas-Works, Portwood.

No Form of Tender other than that issued by the Committee will be accepted.

Sealed Tenders, endorsed "1," "2," "3," &c., as the case may be, must be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office not later than Tuesday, March 15.

No Tender will be accepted without satisfactory proof that the Firm tendering pays the Trade Union Rate of Wages and observes the Trade Union number of hours usually paid and observed in the district where the Goods are made or produced.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
ROBERT HYDE,
Town Clerk.

Stockport, Feb. 25, 1910.

EASTBOURNE GAS COMPANY.

SALE by Tender of £10,000 "B" Stock to rank equal with the existing "B" Stock for a Standard Dividend of 3½ per Cent.—subject to the Sliding-Scale, by the Action of which the Dividend in this Class of Stock is

6¼ PER CENT. PER ANNUM,

Minimum Price, £125 per £100 of Stock.

This additional Capital is required to meet the Natural Growth of the Undertaking in Eastbourne and District and for the Cost of the Extension of Mains to Polegate Junction and the Market Town of Hailsham. The unchecked growth of the Company's Business is indicated below:—

Year.	Number of Gas Consumers.	Gas Sold. Cubic Feet.	Price of Gas
1893	2,900	198,495,000	3s. 2d.
1898	4,250	241,654,000	2s. 10d.
1903	7,005	336,568,000	2s. 10d.
1904	7,345	352,951,000	2s. 8d.
1905	7,750	367,128,000	2s. 8d.
1906	8,182	393,060,000	2s. 8d.
1907	8,564	413,730,000	2s. 8d.
1908	8,854	429,528,000	2s. 8d.
1909	9,423	448,770,000	2s. 6d.

The full Statutory Dividends have been paid for the past 40 years.

Tenders will be received for any amount of Stock being not less than £5 or multiples thereof.

This is a unique opportunity for small investors as well as those with larger means.

Tenders and Particulars of the SECRETARY at EASTBOURNE, or at any of the Branches of the Company's Bankers—BARCLAY AND CO., LIMITED.

Last Day, Saturday, March 12, 1910.

By order of the Directors,
JAMES S. GARRARD,
Secretary.

March 1, 1910.

BOURNEMOUTH GAS AND WATER COMPANY.

ISSUE OF £10 SEVEN PER CENT. "B" SHARES.

MINIMUM PRICE OF ISSUE, £15 PER SHARE.

SALE BY TENDER OF 2019 £10, 7 PER CENT. "B" SHARES, in pursuance of the provisions of the Bournemouth Gas and Water Act, 1896.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 2019 "B" SHARES of £10 each, (the Dividend of which is limited to £7 per cent.) to be paid up in full on or before the 31st of May, 1910.

The Capital now offered is required by reason of the Purchase of Freehold Properties at Alderney and Longham, and for the Extension of the Company's existing Works and Plant to meet the increased demand for Gas and Water by reason of the continuous development of the District supplied by the Company.

The Dividend on the Original Shares for the Half-Year ending the 31st of December, 1909, was at the rate of 10 per Cent. per annum, with an addition at the rate of 5 per Cent. per Annum under the Sliding-Scale, and on the "B" Shares at the rate of 7 per Cent. per Annum. Since the 30th of June, 1904, the Dividend on the Original Shares has been at the rate of 14 per Cent. per Annum, and, for the past Year, at the rate of 15 per Cent. The Net Profit earned in the Year ended the 31st of December, 1909, after deducting all charges, including Debenture and other Interest, amounted to £45,322 1s. 4d., exclusive of Interest on Reserve Investments, amounting to a further £701 8s. 2d., and after payment of Dividends to the 31st of December, 1909, the sum of £27,830 5s. 6d. remained to be carried forward to the current half-year.

Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth and Poole, or of the Secretary as under.

Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Thursday morning, the 17th of March, 1910.

By order, H. A. PLUMB, Secretary.

London: 90, Cannon Street, E.C.,
Feb. 18, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £12,500 THREE PER CENT. DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ROMFORD GAS AND COKE COMPANY, LIMITED.

NEW ISSUE OF 600 £5 "B" SHARES AND £2000 FOUR PER CENT. DEBENTURE BONDS.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of A. G. Tilley, Esq., decd., and other Owners.

THE GASLIGHT AND COKE COMPANY,
£1000 CONSOLIDATED ORDINARY STOCK.

SEVENOAKS WATER-WORKS COMPANY,
£270 CONSOLIDATED STOCK.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY,
£900 CONSOLIDATED ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

HORNSEY GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED STOCK, £6500 FIVE PER CENT. PREFERENCE STOCK,

AND

£3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 22, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

FOR SALE—50 Ordinary Shares in the SOUTH AFRICAN LIGHTING ASSOCIATION, Particulars on Application. Will accept £12 10s. each. Address No. 5199, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 23rd inst., at Twelve o'clock precisely, to transact the usual Business; and to declare a Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 12th inst. and RE-OPENED on the 24th inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard, Lombard Street, London, E.C.
March 4, 1910.

Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1909.

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Testing Instruments

ALEXANDER WRIGHT & CO., LD.
WESTMINSTER.

JOHN COATES & CO., LTD.,
Gas and Water Works Engineers, Inspectors, and Merchant Shippers,
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NOTE. Much expense and trouble is often saved by Colonial and Foreign Gas and Water Companies, and City Corporations, by having their requirements from Great Britain bought or properly inspected by practical men. We have a staff of experts for Buying, Shipping, and Inspection, of Gas Plant and Machinery of every description, Cast Iron Pipes, &c., and may add that our Engineering Branch is under the direction of Mr. John Coates, M.Inst.C.E., and Shipping Branch under Mr. Alfred J. Kingdon, both with over 20 years' experience.
J. C. & Co.

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Class A lifts 24 ft.
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Manufacturers of
DIALS (Enamelled)
For Gas, Water, Electric, &c., Meters.
DIALS
For Pressure Scales in One Length up to 4 feet.
DIALS
For Clocks, Barometers, Thermometer Indicators, and for every purpose.
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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
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RETORTS CAREFULLY PACKED FOR SHIPMENT.

MIRFIELD GAS COAL.
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
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NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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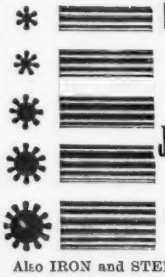

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Also IRON and STEEL WIRE of all descriptions.

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GRASSMOOR COLLIERIES,
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Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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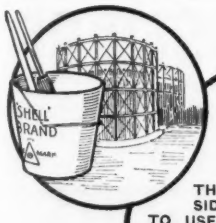

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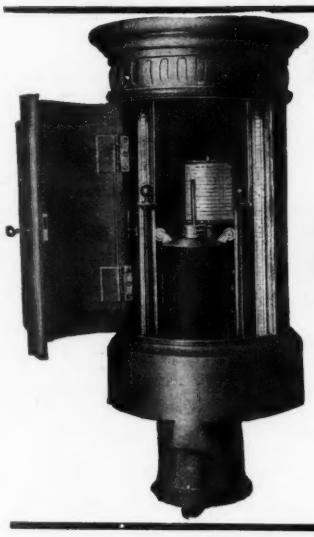

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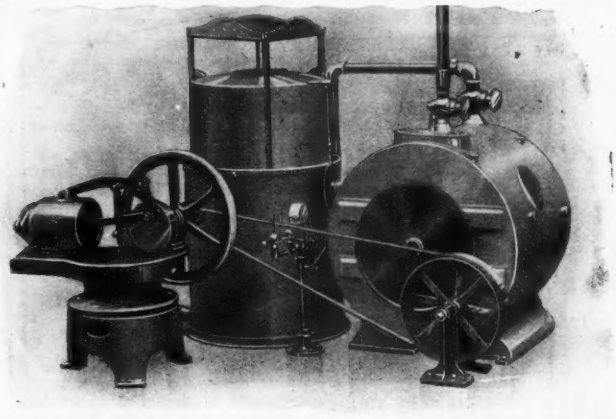

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Patent **DUST and INSECT PROOF LAMP** (Intensified).

The 6A Series.

For **RAILWAYS, SCHOOLS, FACTORIES, SKATING RINKS, &c.**

Just Installed 150 of these Lamps in a large Institution.

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Important Improvements.

BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster;** cannot get out of order.
3. **Automatic Gas Regulator,** ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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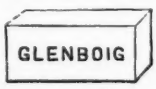

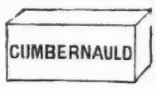

The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

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The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

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The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, Leadenhall Street,
London, E.C., September 21st, 1909.

Dear Sirs,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3·03	3·49
Silica, combined	43·20	49·77
Alumina	36·55	42·10
Ferric oxide	1·80	2·08
Titanic oxide	1·30	1·50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0·92	1·06
Loss on Ignition	13·20	—
	100·00	100·00

PHYSICAL RESULTS.

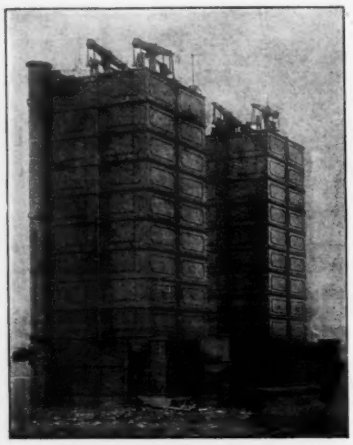
Density	2·65
Volume weight	1·90
Porosity	15·4 %
Linear shrinkage at 100° C.	3·70%
" " " 1050° C.	4·76%
" " Total	8·46%
Volume shrinkage at 100° C.	10·7 %
" " " 1050° C.	12·6 %
" " Total	23·3 %
Plasticity	20·0 %
Fire Stability	1850° C. equiv. to 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.

(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,

JOHN T. NORMAN.



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STRUCTURAL IRON AND STEEL WORK.

SCRUBBING AND PURIFYING MACHINES.

GAS PLANT OF EVERY DESCRIPTION DESIGNED AND ERECTED.

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Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

Entire Gas-Works & Coke Oven Plants,

Retort Furnaces,

Furnaces for Chamber Settings (*Patent*), New Coke Ovens (*Patent*),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia up to 20·75 per cent. Nitrogen.

For Prices apply to the SOUTH METROPOLITAN GAS COMPANY,

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

709, OLD KENT ROAD, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

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OUGHTIBRIDGE.

RADIATE MORE HEAT

BY USING

SILCO BRICK RETORTS.

SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

Welsbach
LIGHT
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

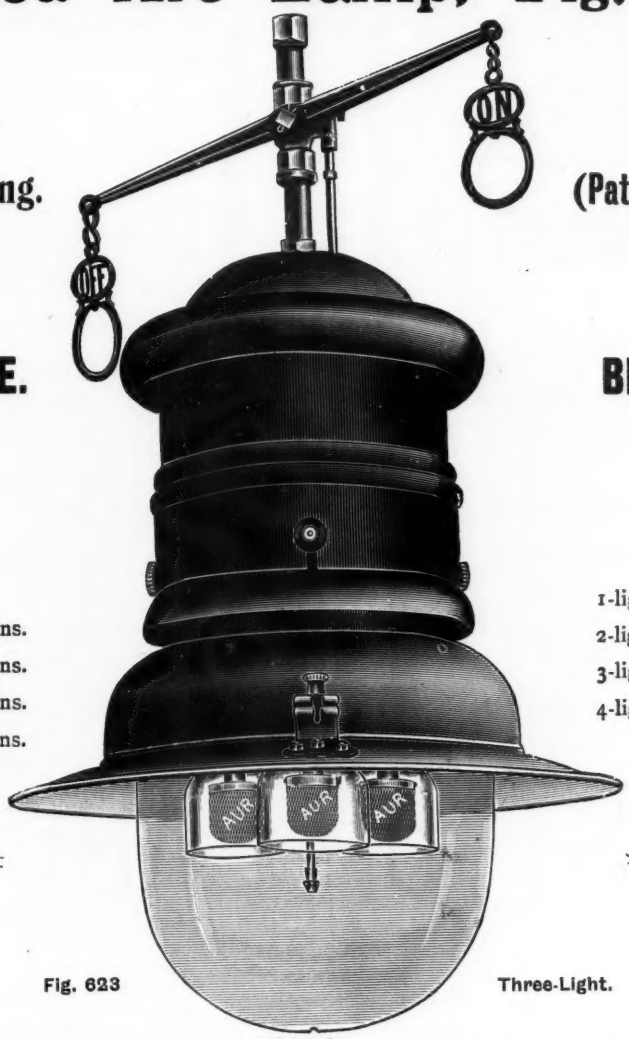

Fig. 623 Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.
3-light	12 feet	400	**52/6**	**6/-** extra.
4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON." *Telephone 2410 NORTH.*

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IN

VERTICAL RETORTS

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GLOVER-WEST PATENTS.

Description and Particulars of Tests will be forwarded on request.

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COST OF LABOUR

REDUCED TO

$2\frac{3}{4}$d. PER TON OF COAL CARBONIZED.

See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

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GRAHAM, MORTON & CO.,

— LEEDS. —

RETORT BUILDERS ON THE

INCLINED, HORIZONTAL, OR VERTICAL

SYSTEM.

Contractors to the Vertical Gas Retort Syndicate, Ltd., for all BRICKWORK in the

DESSAU VERTICAL RETORT INSTALLATIONS.

See Certified Results of the first Installation on this System in England erected at The Ayres Quay Gas-Works, Sunderland.

Makers and Erectors of

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STEEL STRUCTURAL WORK. ROOFS, &c.

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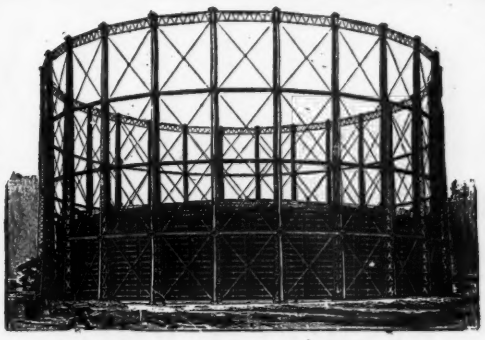

Triple Lift Gasholder, 212 ft. 6 in. diameter by 45 feet Lifts, erected at Garston, Liverpool.

Manufacturers and Erectors of

- *GASHOLDERS.*
- *GAS PLANTS.*
- *STEEL PIPES.*
- *STEEL TANKS.*
- *CONSTRUCTIONAL STEEL WORK.*

HUMPHREYS & GLASGOW'S CARBURETTED WATER-GAS PLANTS.

Aggregate capacity of Plant supplied 228,600,000 cubic feet daily.

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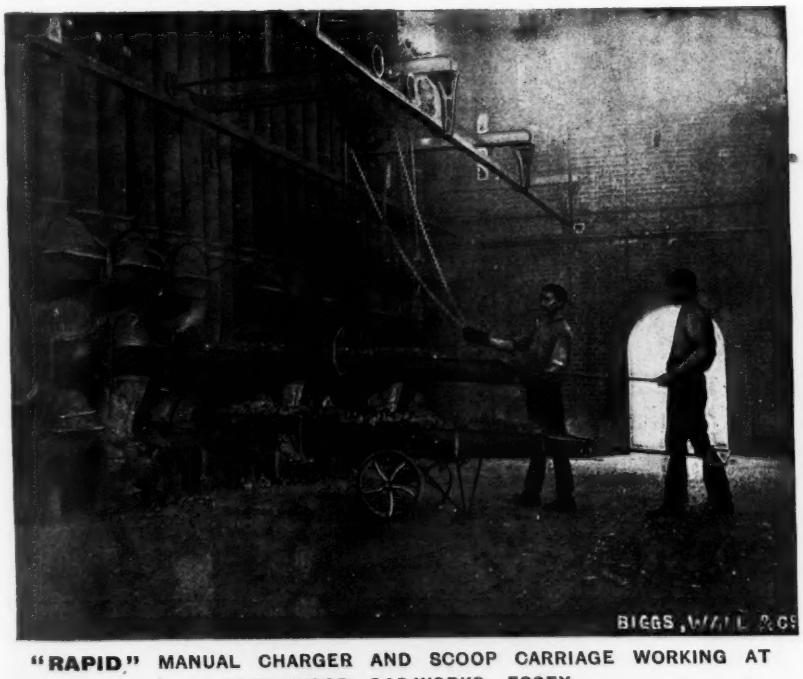

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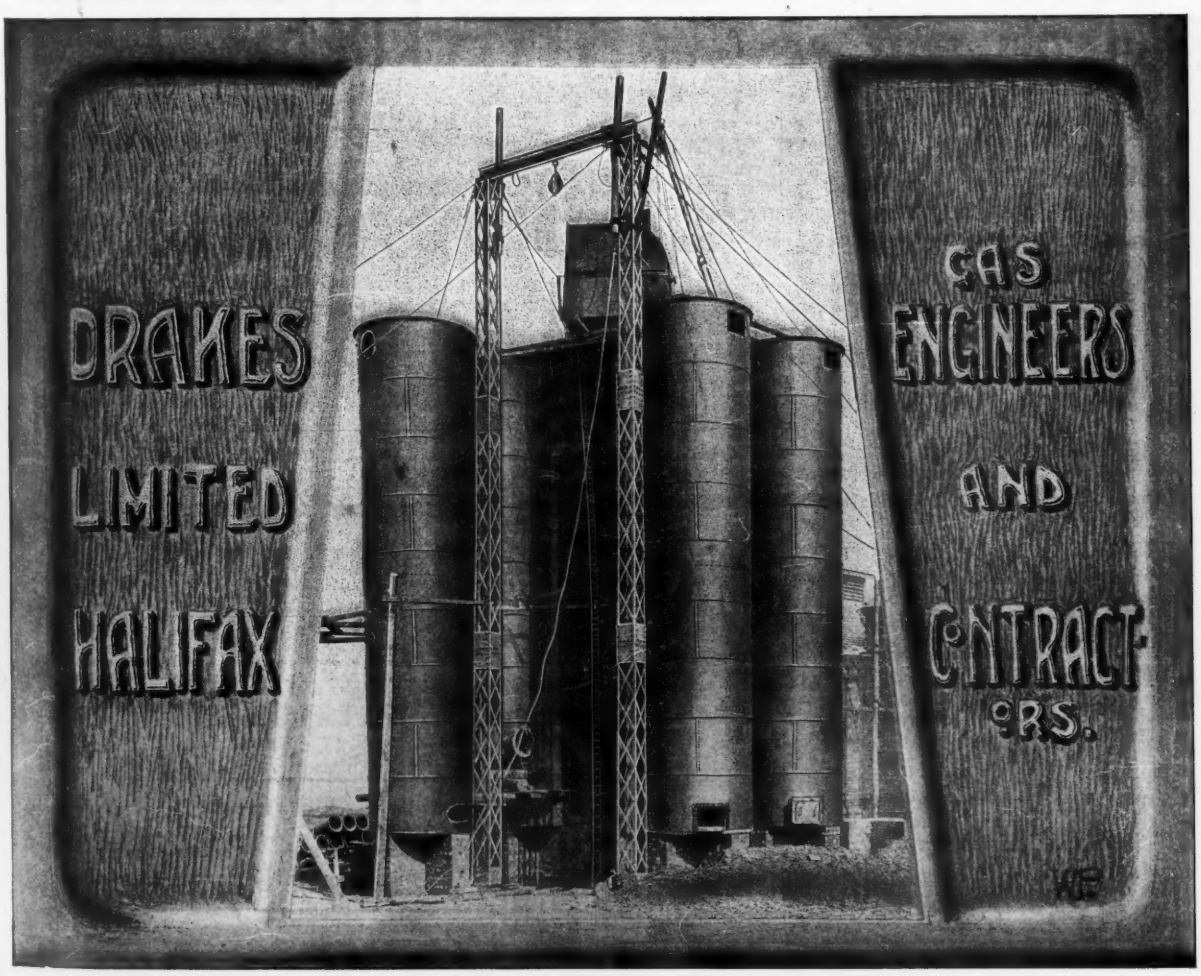

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